FIFTY YEARS' MEMORIES—STUART ROBSON | 10 CE a C

2076

EVERYBODY'S MAGAZINE

FOR JULY.

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THE WHAT, WHY AND HOW OF LIQUID AIR

DONT HAVE TO TRAIN
TO PREPARE FOR
HOUSE-
CLEANING

USE
SAPOLIO
IT KNOCKS OUT
ALL DIRT

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EVERYBODY'S MAGAZINE

JULY, 1900.

LIQUID AIR.

BEING No. 7 OF THE SERIES "SIMPLE EXPLANATIONS."

By H. George.

When a scientific discovery has become a matter of commercial exploitation, it has, as a general thing, passed the experimental stage, and its limitations and possibilities have usually been pretty well defined.

Liquid air is *not* a case in point. It is remarkable how freely the promoters of its practical usefulness admit that what it is to do and what it is to be are matters for the future to determine.

With a single exception, to be later mentioned, the writer knows of no actual *practical* demonstration of its usefulness. Its possibilities are tremendous—but undefined. To be sure, engines have been run, in a laboratory, and certainly a substance that is nearly 350 degrees colder than ice needs no argument to prove its powers of refrigeration. But there is a cold, hard question of *cost* to be considered in all commercial matters, and as yet liquid air is neither cheap nor easy to handle. It is to explain why it is costly and how it may be cheapened, as well as to explain what it is, that this article is written.

All substances known to this earth are of one of three classes: they are either solids, liquids, or gases. And it has been known for a long time that the difference between these three forms of matter is merely a question of *temperature*.

Ice is a solid. Heat it a little and it becomes a liquid. Heat it a little more and it becomes steam—a gas. That is familiar to everybody. And what is true in this line of ice or water, is true of every substance on earth.

Let steam get cold enough, and it is water again. Cool the water sufficiently and there is ice. This rule "works backwards" in this way for every other gas. Air is a gas. Consequently we shall have air in liquid form the instant we get it *cold* enough.

So you can see that matter is solid, liquid, or gaseous only when you consider its "normal" temperature. On this earth, that normal temperature is the temperature of the atmosphere, generally considered at 70 degrees Fahrenheit for the sake of getting something like an average. We therefore speak of iron as a solid, because it is solid at our normal temperature; but an inhabitant of the sun, if you can imagine such, would know iron either as a liquid or as a gas. We call water a liquid; but if there is any resident of the moon, water is a solid to him. It is all a matter of *temperature*.

There is nothing at all mysterious about this. The reasons for it have been known for nearly a hundred years. It is a question of *molecular action*; and if we would really get at the bottom facts of liquid air, we must go into the general subject of molecular motion, especially in that form which we know as "heat."

Note that last clause. There is no such "thing" as heat; it is merely molecular vibration. It used to be supposed that

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heat was a sort of substance, a thing by itself. That theory received some fatal blows about a century ago, but it died hard, and still had a kick or two left within the past fifty years. Now, however, it is dead forever. Heat is motion, exactly as sound is motion. A blow on a drum starts a wave motion in the air, and when it strikes our ears we call it "sound." It is purely mechanical. So a vibrating molecule sends its tremors through the ether, and when we feel it through our nerves we call it "heat."

In a previous paper in this series * some attempt was made to give an idea of the atomic and molecular theories. We must go over the ground again, briefly.

It is known that all matter is composed of *atoms* clinging together in what are known as molecules. An atom is the smallest possible division of matter. It is hard to give an idea of its ultimate and absolute *littleness*. A microbe that requires a magnification of several million times to make it visible is composed of unnumbered millions of atoms. Nobody knows just the shape or size of atoms. Lately they have been supposed to be hollow rings, having an inconceivably rapid twisting motion, like the "vortex ring" that a smoker makes—if he can. No one has ever *seen* an atom. No microscope has ever brought one within our vision, and probably no microscope ever will be able to do so. Not only are they too small, but they are *in motion* all the time, and at a terrific speed. They vibrate, as the rim of a bell vibrates when struck, but, different from a bell, the vibrations of an atom never cease. Besides their vibration, they are always *travelling bodily*, flying through inconceivably short distances at a rate (in some cases) of more than a mile in a second. They travel until they strike another atom; then they rebound to another collision, and so on forever.

There are as many *kinds* of atoms as there are elements in the universe. Carbon, hydrogen, oxygen, iron, copper—all the simple elements are composed of characteristic atoms. When you come to compounds, like water, for example, which is composed of oxygen and hydrogen, you find two or more kinds of atoms clinging together in a "molecule."

A molecule of water consists of one atom of oxygen and two atoms of hydrogen.* They are not believed to be in actual contact, but they are held very closely together by virtue of the attraction of "chemical affinity," which is a very powerful attraction indeed, but not at all to be explained.

For the sake of getting a mental picture —a picture, mind you, that may be very far from the fact—imagine one gold ring and two silver rings laid together, their peripheries almost touching. The gold ring is the oxygen atom, the two silver rings the hydrogen atoms. Remember that each of these has possessed motion from the beginning of things, and will continue that motion in some form until chaos comes again. As the atoms have motion, the molecule has it, in a certain characteristic form of its own that is exactly like all other water molecules under the same conditions. The motion is a combination of the motions of the atoms. The molecule as a whole is vibrating, and is travelling and bumping its neighbors. These motions of course are unimaginably small, but they exist.

Now, it may be easy to see that the difference between a solid, a liquid, and a gas is the difference in the distance that separates the molecules. For the sake of getting a mental picture again, let us take a rough-and-ready analogy, as follows:

Imagine a large number of insects, so tiny as to be invisible to the naked eye, confined in a glass globe large enough to give them plenty of room to fly about. Suppose them to be extraordinarily active little bugs, that ask nothing but the chance to fly about forever. In their glass prison-house they fly to their heart's content, and bump violently against each other and

* "Electricity and Some Other Puzzles" in June number.

* A curious mental reversal of terms occasioned an absurd error in the previous paper, by which this combination was "stated backwards," as one just critic observed.

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against the sides of the globe. But they would be invisible, because they are too small to be seen separately, and they remain separated.

Now suppose the globe to be chilled enough to take the brightness and vigor out of the insects. They can no longer fly, we will say; they can only crawl. They crawl together in a huddle at the bottom of the globe. Now you can see them; not as insects, but as a *mass*—a loosely compacted, squirming mass. In the same way a gas, by being chilled enough, becomes a liquid. The molecules are huddled closer together, have less room to move, have lost their power of motion, and, as a mass, can be seen.

Suppose, further, the insects to get so close together that each can seize and grasp his neighbors, and that each does so with all the force he can. Now your liquid is a solid. But you can see that there is still a chance for the insects to wiggle a bit, although they cannot get away from the clinging grip of their associates. So, in a solid, even in the hardest steel, there is a molecular *tremor*.

Now suppose the chilling process to be stopped, or suppose a gentle amount of heat to be applied to the globe. At once the insects recover life, and, in obedience to their inherent instinct, endeavor to get clear of each other and get back to their business of flying. First, they begin to release their grip on each other, and soon your "solid" mass is loose and "liquid" again. As more and more heat is applied, the insects at the top of the pile begin to recover the use of their wings, and fly up into free space and invisibility. Your liquid is "boiling" now, and will continue to boil until all the insects (that is, all the molecules or atoms) have recovered their orginal vigor and are flying about as at first.

Having given (I hope), by this use of a rather rough analogy, some idea of the changes in form between a solid and a gas, let us come closer to the question. Molecules are not alive. *Why* does heat affect them? As one of the chief aims in this article is to make plain, if possible, just what heat is, or, rather, what it is *not*, let us go back to our water, composed of molecules that are vibrating and bumping about. I wish to show that what we call heat is simply *motion;* that it is purely mechanical.

Suppose one molecule of the water was in some way given a *blow* by some outside force. Its vibrations are increased, and it flies across the tiny space to its next neighbor with greater speed, and hits that neighbor harder than before. That hard-bumped molecule passes the whack along to the next one, and the effect goes on spreading until the original force, whatever it was, is exhausted. Remembering that heat is motion, you can see that additional motion means additional heat. The water, therefore, is *hotter* than before by exactly the amount of extra motion given the molecules.

Let us continue with our water—we'll get to air by and by. Suppose the original blow to be repeated with tremendous rapidity and increasing force. The molecules increase their movements violently. Their collisions grow faster and harder, their vibrations wider and wider. Finally the impacts may be so severe as to actually drive the surface molecules up into the air, too far for the attraction of their former neighbors to coax them back again. The free molecules instantly take advantage of the additional room given them. They fly about as before, but now there is much more space between them, they are invisible, and that much water has been *vaporized*. That is what happens whenever water boils. The blows in such case are given by what we call "heat," but really it is purely mechanical. Carbon and oxygen uniting in combustion produce a tremendous agitation of their molecules. That agitation is carried through the ether to the bottom of the kettle; molecules of the iron kettle carry it along to the water molecules, and there you are. But you could make water boil by stirring it with a stick, just as well, if you could stir fast enough. Heat is motion: motion is heat; get that fixed. If you heat matter, you accelerate the motion of its

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molecules; if you accelerate the molecular motion in any way, you get heat.

Now for the next step. We will suppose the boiling water to be in a closed boiler. At first there is little pressure on the surface of the water, and the top molecules can fly up easily. We know that when the temperature of the water reaches 212 degrees its molecules are hitting each other hard enough to knock the top ones away. That is the "boiling point" of water. But as more and more of them get free, and the pressure on the surface increases, the water stops boiling. Why? Because, on account of the surface pressure, it now takes more force to drive the molecules upward—you must heat the water more. So increased heat inevitably means increased pressure when the molecules are confined.

Another step. Increased heat means increased pressure; so also increased pressure means increased heat. Remember the molecules in *all* bodies are always in motion, and the temperature depends on the violence of that motion. If, therefore, you squeeze the molecules closer together, they have less room to fly about in, and they will *hit each other oftener* in a second than they did. By those multiplied impacts their vibrations are increased, there is more violent motion (albeit in less space), and there is consequently more heat. That is why the pump gets hot when you inflate your bicycle tire.

Another step. Suppose that into boiling water there is suddenly introduced something colder than itself. In other words, you have introduced among a number of flying, bumping molecules a number of other molecules that are moving at a slower rate. What happens? What would happen if in front of a fast train were placed a slower train? The fast train strikes it and its speed is instantly checked, while the slow train is pushed ahead faster. The fast train cannot go ahead at its first speed until the one ahead of it has been "worked up" to that speed. And that takes more power. So if you pour cold water into boiling water, the boiling stops until the cold water reaches the boiling point, and you must add more heat to do that.

One more step, and we are now ready to abandon the water and take to air. We have seen that pressure means heat, and that a "slow" molecule will slow down a fast one, and a fast one will hurry a slow one whenever they come in contact.

Now here is a reservoir of compressed air, its molecules bumping furiously, and very "hot," as we say. First, the bumping against the sides of the reservoir starts up the vibrations of the molecules of the metal, and the metal gets "hot;" the air by the process *losing some of its motion* and hence some of its heat. The molecules of the metal transfer the motion to the outer ether, and the heat waves pass out in gradually lessening circles, until at last the excess of motion is exhausted, and the compressed air and the metal and the surrounding air are all at the same temperature. In common language the heat has been "radiated" away. But the compressed air molecules, having lost their excess of motion, need less room, the impacts are slower and less violent, there is a marked *decrease* in the pressure; so you see why cooling is a "contracting" process, as heating is an "expansive" one.

There is still, however, considerable pressure inside. The molecules there are crowded closely together, but now (being at the same temperature) are vibrating no faster than the outside air.

Now open the valve and let the crowded molecules escape. Their elasticity drives them into the free air outside, and they at once *expand* to their normal size and position to each other. But as they do so they become very *cold*. Why? Because their motion at the time of escape is the same as the outer air, yet on escape they have, we will say, twice the space to move in that they had while imprisoned. Wider space to travel and no increase in speed means fewer collisions a second, hence momentarily a *slower rate* of vibration. But the outer air molecules soon beat them up to speed again, *thereby temporarily losing some of their own motion and heat*, as the fast train did when it struck

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the slower one. So expansion is a *cooling* process. It is not so easily explained as the reverse process, nor so familiar, yet, if you will hold your hand over the valve of a deflating tire, you can readily feel the chill of the expanding air.

Liquid air is made by first compressing air, thereby heating it; then robbing it of its heat; then allowing a little of it to expand around the pipes that hold the compressed air, thus cooling the latter more; then compressing and cooling again; till finally the molecules are squeezed so closely together and yet are so cold that they lose enough of their normal gaseous vibration and motion to deprive them of the elasticity that kept them apart as a gas. Their lively motion is chilled down to a comparative torpor, and they hang together closely as a liquid, precisely as cooled steam becomes water. If the process could be carried a little further, the liquid air would *freeze*, precisely as water becomes ice. But, as it is, air must be chilled to 312 degrees below zero before it liquefies.

The compression, you see, is only incidental. If there were any other way to get that degree of cold, air would liquefy at practically no pressure at all. It is a matter of temperature, as stated. A gas is a gas because its molecules are (compared with a liquid) far apart, and they are kept apart by the elasticity that makes them rebound after colliding. The number and force of those collisions (it cannot be said too often) are, or depend on, *heat*. Reducing the heat reduces the motion, therefore the force of the collisions, therefore the vigor of the rebounds, therefore the distance between the molecules.

Liquid air is not a new thing at all. It was manufactured nearly fifty years ago, as a laboratory experiment. But the process was that of terrific compression, actually forcing the molecules of air by main strength to such close quarters that the attraction of each of them for the others held them together as a liquid. The pressure required was tremendous. Molecules may be small things, but their forces are vast. It takes great power to drive them apart if they desire to remain together, and it takes even greater power to press them closer than they care to go. So the first liquid air produced was in quantities to be measured by teaspoonfuls, and it cost something like $2,000 an ounce.

It was Professor Dewar, of England, who first used the principle of *chilling* the air by the expansion of a part of it already compressed. Chilling the air, as explained, takes away tremendously from the power of the molecules to resist compression, so Professor Dewar obtained liquid air in gallons, at comparatively a small cost. In this country Charles E. Tripler, by certain improvements in the Dewar process, claims to have produced liquid air at a cost of about twenty cents a gallon.

Liquid air is intensely cold. It is almost the very coldest thing with which man has had actual dealings. Its temperature is 312 degrees below zero. If the explanation in the preceding pages has been of any use, you will know that it is "cold" because its molecular motion is extremely small and extremely slow, as compared with the normal rate.

Now, everything that it touches is eager to beat this motion back to the old rate. The atmospheric air with which it comes in contact has the original vigor, and no brother could be more anxious to wake up his frozen relative. The molecules of the glass jar that confines it are also vibrating at a terrific speed in comparison; everything that touches it tends to give it back the motion it has lost. But, on the other hand, everything that touches it, to give it back its motion, must lose most of its own—again recall the fast train ramming the slow one—so that the air remains liquid for some time, because it instantly cools down everything that touches it to its own rate. But, of course, the balance of nature is against the air remaining in such an abnormal condition, and no device yet produced has been effective against the rapid warming and expanding of the liquid. Air in its liquid form has its molecules 800 times *nearer together* than atmospheric air. Consequently, when it regains its original

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state, a cubic foot of liquid air would fill a building considerably bigger than the Capitol at Washington. The expansive force may be imagined. Nothing that man's hands can make as yet can confine it. It will burst the strongest steel tubes as easily as a boy can burst a paper bag. The only way it can be handled is to keep it as cold as may be, and give it an opening through which it can expand as it must. But at the best, it cannot be kept long, and this is one serious obstacle to its practical use. A gallon will keep about a day. Five gallons were once shipped to Chicago, losing four-fifths on the way. The instant that it is taken out of its receptacle it boils away *faster* than water thrown on a red-hot stove.

Of course it will freeze up anything that touches it, provided the substance does not possess enough heat to overcome its own intense cold. A piece of meat, for example, can be frozen so solidly that it will crumble like sand.

It freezes mercury as hard as iron, and a few quarts thrown around a room will reduce the temperature temporarily several degrees.

Of course the terrific power of expansion that it possesses suggests it at once as a means of running machinery. It stores up power in a wonderfully small space, and if it could be produced cheap enough, and if it could be handled economically, there is no doubt that it would at once eclipse all other forms of stored energy.

On May 19th last a practical demonstration of the application of liquid air as a motive power was made by the Liquid Air Automobile and Power Company, of Boston. An automobile of its own design and construction was propelled by about two quarts of liquid air, over ordinary dirt roads, for a distance that appeared to be satisfactory to its operators, and which certainly gave great promise of eventual results. This was the first actual demonstration of practicability under working conditions.

This company, as also the Tripler Company, of New York, and probably others, has also run the machinery of its laboratory with a liquid-air engine.

But, in figuring on the eventual use of liquid air in commerce, keep the fact in mind that *heat is motion, and heat can neither be given nor taken away without motion, and motion means power, and power means cost.* There is nothing better settled in natural science than that heat and work are interchangeable in a perfectly exact ratio. The steam-engine cannot give an ounce more power than it gets from the coal burned under its boilers.

There can be no more power in liquid air than is given it by the engines that run the compressors. Truly, that power once obtained is stored in wonderfully little space; but it is not *created* power, it is *stored* power.

The compressors in all liquid-air processes heat up so tremendously that they would be destroyed if they were not constantly cooled by running water. Every last molecular tremor of that heat came from heat that was generated under a boiler. It is all thrown away in making liquid air.

The Boston concern already referred to intends to utilize this waste heat, and, by carefully conserving all the energy of compression, heat and cold, expects to make liquid air at a very small cost. If the system is perfect, and there is absolutely no waste, the liquid air would contain all the energy of the engine that ran the compressors, and there would be the cheapest form of power yet obtained; for the best storage batteries can give but some 6 or 7 per cent. of the *heat power* (not electrical force) that was used to charge them, and only 80 per cent. or less of the power that went into the dynamo.

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THE BANK OF ENGLAND.

WHERE ROYALTY BANKS.

By S. Fernor

The practice of economy is not confined to people born in the average station of life, for there are many notable instances of economy and thrift among the royalties of Europe.

Here are a few examples:

During the forty-four years that the late Empress of Austria enjoyed the large income allowed her by the State she habitually lived well within it, notwithstanding her reputed eccentricity; indeed, it showed her wisdom. In the early part of her married life her savings were invested in real estate in the suburbs of Vienna, the land, then unbuilt upon, being now covered with houses, increasing its value a hundred-fold. Nearly the whole of the vast fortune realized in this way was judiciously invested in London stocks, her business being carried through for her by the Bank of England, in whose books appeared for many years a sum of money to her credit, amounting to considerably over a million.

The Mother-Queen of Spain is another of the economical royal ladies whose saving propensities and custom of banking her savings with the Bank of England are responsible in a great measure for her present unpopularity among, at all events, a certain section of her son's subjects.

Like the other monarch whose name we have mentioned, Queen Christina is confident that no other national bank in the world provides almost absolute immunity against possible loss like the bank which transacts the business of the wealthiest empire of the world—the British Empire. Her Majesty, doubtless reasonably suspicious of apparent possibilities, is in the habit of sending a confidant at various times all the way from Madrid to London for the purpose of "paying in."

Other monarchs, more free from the scrutiny of observing eyes, transmit their bonds and securities, as a rule, through their respective embassies. Although Queen Christina is entitled to draw from the Spanish treasury one million pesetas (about $200,000) yearly, yet she has not, owing to the straitened circumstances of Spain, drawn a cent of this money.

It is well known that the papal court is

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very wealthy, but while the Pope is usually credited with the possession of many millions, yet his holding is only nominal, the vast sums comprising the papal treasury mainly going towards the payment of the liabilities incurred by the numerous ecclesiastical foundations throughout the world. The residue, though, is princely in itself, and this in the time of the late pontiff was invested in securities which were also held by the Bank of England, and it is assumed that Leo XIII. has followed in the wake of his predecessor.

The King and Queen of Italy, too, are careful, and economize as much as they can, and while, perhaps, the best portion of their joint savings are invested at home, not an inconsiderable part finds its way to the city of London, where it is invested in sound holdings that realize for the royal couple a nice addition to their income.

The late Tsar was another thrifty and economical royal personage, who, at his death, had over $5,000,000 to his credit at the Bank of England. The bulk of this, however, was left to the Princess of Wales, to whom he was deeply attached.

Alexander II., grandfather of the present Tsar, was another monarch who economized in order to provide at his death a large sum of money for the comfort of his morganatic wife and children. He deposited in her name at the Bank of England no less than $20,000,000, to which fortune the lady and her family duly succeeded.

The Tsar banked that money in England firmly convinced that in no other institution in the world would this large fortune be more secure either from seizure by his successors on the throne or from disappearance through the collapse of the bank.

Had this money been placed in the Bank of France, or in the national banking establishments in any other country—say Austria, Germany, or Holland—the local registration of a decree of injunction obtained by the Russian Crown would have been sufficient to debar the widowed lady from touching the money destined for her use. But Alexander well knew that once the money had been credited in her name in the Bank of England the setting in motion of any complex legal machinery for depriving her of it would have been fruitless and a sheer waste of energy.

The Emperor Frederick only reigned three months, but in that short time he was able to place to the credit of his English wife, the Empress Frederick, a fairly comfortable sum he had saved, on the interest of which principally the Empress finds living easy.

When the late Napoleon III. found that his throne was tottering, in the latter part of 1869 and in the spring of 1870, he had the wit to place his savings—which were considerable, notwithstanding that he was considered lavish in his expenditure generally—in the Bank of England in the name of the Empress Eugenie, and it is due to this precaution that the ex-Empress remains to-day one of the wealthiest of royal widows.

The present Sultan of Turkey may have wild notions on the question of humanity and its bearings on matters connected with his throne and person; and, fearless though he is in many things that affect his government, he is nevertheless apprehensive that there is nothing sure or safe in this life, so he, too, saves—cautiously dropping his savings in all sorts of hiding-places in Constantinople. He is also shrewd enough, in case the latter are discovered at any time, to send vast sums to London; but he looks askance at fluctuating stocks, and consequently prefers the deposit system.

The Khedive, too, sends all his savings to London; in fact, there is hardly a ruler of any importance who fails to send his overplus income for investment in the British securities in connection with and governed by the Bank of England, excepting Queen Victoria, who, curious to say, does not place her money with the national bank, but with the private firm of Coutts.

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A QUESTION OF RELATIONSHIP.

By Merriden Howard.

There were three of them living together in the shanty. It did not belong to any of them, but they stayed there because the owner had gone to England, and they agreed together it would be a pity to let the place spoil for neglect.

A smell of cooking pervaded the house, because Leicester was frying bacon and beans over the stove, and every now and then he stopped to abuse Crawford, who had given up his duty of whipping a basin of milk into butter, and was pulling cactus needles out of his legs and grumbling horribly because they hurt him whenever he sat or moved.

In the next room Hallett, who had promised to clear away the breakfast, was playing hymn tunes on the piano. He had been told to leave off, and several things had been sent through the door to refresh his memory, but he went on complacently, knowing it would save trouble to use the breakfast plates over again for dinner.

The tinkle of the piano grew louder, and the tall man who was working at the stove took advantage of the noise to ease his mind of a matter which was assuming the proportions of a trouble.

"There is something the matter with Hallett," he said. "Something which is changing him for the worse."

"If sunstrokes had ever been heard of in California," said Crawford, "I should put it down to that. There's a queer look in his eyes at times, and he's so tarnation restless. Listen to him now!"

The hymn tunes had been abandoned, and there came through the half-open door snatches of melodies and stray chords, an incoherent medley of notes.

"He's a queer fellow," observed Leicester, "I swear I understand him less now than I did when he first came out and grumbled because he had expected to find this better than the old country and was wrong."

Crawford laughed softly to himself. He had grown tired of hunting for cactus, and went over to the door and stood there looking out through the shady sycamores to where the sun was flaring down on the mountains with the full heat of a Californian day.

Outside, a horse hitched to a post stood with its head drooping. And beyond, where a scrap of hillside was terraced into a vineyard, a barefooted boy lay stretched at full length, part of the general inertness. The sight of the child seemed to suggest a new train of thoughts to Crawford.

"There's young Leslie," he said, without turning his head. "What on earth is he doing over here?"

"Dropped from the skies with a note for Hallett. Walked the whole way, he says."

Crawford drew a long breath.

"A note! That's something new, isn't it?" he remarked, and the lines between his eyes deepened a little.

"Never heard of it out here before," said Leicester truthfully. "It was a woman's handwriting, too!"

"In that case," remarked Crawford, staring hard at the horse, "Mrs. Merle sent it. I tell you what it is," he went on slowly, "there's mischief brewing. Hallett's the dandiest fool with a pretty woman, and Mrs. Merle——"

"Is the most charming creature on God's earth," said Leicester reverently, "but also a fool if that kind of thing's afoot. Let me see. The Merles have been out here three weeks, possibly four. No, Jim, you're hurrying things too much. Besides, they can't have been married long. I'll take my oath Merle is not more than twenty-three, and she—well, twenty-five's the limit."

"At all events, there is no love lost between them," remarked the sunburnt philosopher at the door. "I lost five dollars to Benson last week, betting they were

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brother and sister. But there happened to be three letters for Mrs. Merle at the store, and I had to pay up."

"It was a certainty for Benson," said the cook. "You see she wears a wedding ring; that usually decides these points, you know."

The piano in the next room had stopped suddenly, and a clean-shaven man in riding boots and a store shirt came into the kitchen. He brought with him an indefinable air of refinement.

"I'm going to ride over to the Valley this afternoon if the cultivating can wait," he said.

He went over to where Crawford was standing and began mopping his forehead. The horse's head had sunk lower than ever; the small boy had disappeared, as if the sun had finally melted him away.

"It seems to me," said Crawford, while he purposely avoided the other's eyes, "that the rains are due to begin tonight."

There was not a cloud anywhere in the blueness of the sky, but there was a feeling in the air as though a storm were brewing.

Hallett filled himself a plate of bacon from the frying-pan and ate it standing.

"By the blessing of God it will rain," he observed; "and for that reason I shall start at once."

Leicester looked at him sideways.

"If you are going to the Merles'," he said tentatively, "you might bring back some geranium cuttings."

The slightest possible flush showed through the brownness of the other's skin, but his blue eyes remained inscrutable.

"I will not forget," he said, and with that went out and began strapping his coat to the pommel of the saddle. His fingers were shaking. He waved his hand genially toward Crawford and thereupon went off, leaving a feeling of general discontent behind him.

The horse set out at a gentle lope, like an animal which understands thoroughly he has a long journey before him in the heat. Hallett, sitting back in his saddle, began humming a melody to himself. Presently, as the mountain trail grew steeper, the words died from his lips and his straight brows grew together in thought. There had been a look on Leicester's face, as he had seen it last, which he could not forget, and it annoyed him.

"It's my own business entirely," he said to himself. There was no pricking of conscience, only a feeling of irritation that his motives should have been probed. Such a wild and unreasoning love as this which had taken hold of him belonged to a region where conscience exercised little enough sway.

The top of the hill had been reached suddenly, and the mustang stopped short to recover her wind. For miles Hallett could trace the road winding wearily over the bare mountain, strewn with rough boulders and showing in places a tiny patch of cactus. Below he could trace the gray-green line of the willows and eucalyptus that ran beside the dried-up course of the river. Here and there a few white houses lay scattered among the distant ranches with squares of orange trees beside them and interminable lines of leafless apple trees. And among them one house whiter and cleaner than the rest, with a waving avenue of pampas grass beginning at the road and ending where the miniature garden began, making a picture —the background to another picture—that, sleeping or waking, did not leave his mind.

Hallett dismounted leisurely and lighted a cigarette without taking his eye from the scene. He was drawing long breaths, and his eyes shone.

A solitary live oak, which seemed by mere chance to have grown in that treeless region, and which, as if tired of its struggle with the arid soil, had fallen, its great core eaten out by time, lay a few yards from the trail. The mustang, freed of its rider, had strolled toward it and was nibbling at the bark. Hallett, remembering it of old, made use of it as a seat; his eyes still on the little white house.

Up the trail from the valley a man on horseback was approaching. A tall, slim figure, who sat his horse well, but with a forward seat that betokened one unused to

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the country. Until he was quite close, Hallett did not throw him so much as a glance, but suddenly his face hardened.

"Hello!" the newcomer called out cheerily.

"Hello, Jim Merle."

"I was coming over to see you," he said, "I wanted to use your files."

He had a saw in his hand, and he waved it over his head as he spoke.

"You will find the boys at the house," Hallett replied as he rose from the tree and swung into his saddle. A feeling was coming over him that if he stopped there another moment something would happen which he might afterward regret.

Merle thanked him, wondering at the savage look which lurked in those usually placid eyes.

"Look in at the ranch as you pass," he said, with a little wave of the hand; "Monica will give you tea."

In his voice there was an undercurrent which Hallett noticed, but noticed stupidly. Just for a moment they faced each other, and then Hallett's eyes dropped and he swung his horse's head round sharply.

"Till we meet again," Merle called out. He got no answer, and he laughed oddly as he, too, swung round and disappeared in the opposite direction in a cloud of yellow dust.

There were many ranches in the valley, but not one which had flowers in the garden like the Merles'; not another within a hundred miles with that level stretch of turf between the beds. It was an exquisite luxury, and Hallett's sun-dried eyes revelled in it as he hitched his horse beside the windmill, and pushed through the little cross-bar gate. The veranda was deserted, and he walked inside the house like a visitor who is sure of his welcome. A girlish figure rose to meet him as he entered, holding out a slim hand, which he engulfed in his brown palm.

"I am glad you have come," she said. Hallett tried to say something, but could not. Something seemed to rise in his throat and choke him.

He looked into her eyes, and then round the room, and back again to her eyes contentedly.

"Well?" she said, smiling. He smiled, too, a little uncertainly.

"I feel different when I come in here—that's all," he said.

He had seated himself by the window, through which the perfume of a hundred flowers came crowding.

"I did not need your note to bring me," he said, with lazy reproach.

"No?" very dubiously. And then: "I want you to help me," she said.

"From the most selfish of motives, that of giving pleasure to myself," he replied. "You know there is nothing in the world I would not do for you."

"It's about Jim," she said.

Hallett had not expected this. What was there about her husband she could find to say to him? He shifted a little.

"It's about Jim," she repeated, and he detected a trace of nervousness in her voice, a little tremor which made his heart beat faster. "I don't think he is happy here. Everything I do jars upon him. Yet I try to please him. I—" She broke off with a little pathetic gesture. Her big eyes were filled with tears.

Hallett felt himself trembling.

"And you blame yourself?" he said slowly, like a man who understands with difficulty. He drew his hand across his forehead, and pulled it back covered with moisture.

"Of course I do," she said vehemently. "Sometimes I hate myself. You have been good to me," she went on, with a curious hastening of her voice. "I want you to be his friend. Grant me that. Promise me you will try to cheer his life."

Hallett nodded dully.

Outside a few big drops of rain were beginning to fall. The sky had clouded over. The windmill was whirring round, creaking at every turn with a dismal, lifelike cry.

It did not seem to him to be worth while to stop longer.

He took up his hat and got up slowly.

"I must be going," he said at last. Then he sat down again suddenly. "Tell

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me," he said, "do you think it is possible for a woman to love twice?" He tried to catch her eyes, and failed. She was pouring him out a cup of tea, and she bent her head so that he could see nothing but the hair.

"It might be possible," she said at last. "I don't know." Her voice was very low, so low that he hardly caught the words. When she looked up he noticed a little flush which had crept into either cheek.

He got up and took the tea from her hand, but made no attempt to drink it.

"If—" he began, and stopped. The patter of the rain and the humming of the windmill sounded more loudly than ever through the window.

"Well?" She looked straight into his face and laughed.

He put his cup down and walked up to her deliberately.

All his hesitation had vanished.

"You know what I mean," he said. His heart beat faster and faster.

She turned her head ever so slightly away.

Then he bent forward and seized her hand, and put one arm round her and forced her face up to his. The next moment his lips were burning upon hers.

"Monica!" he cried.

She whispered something that he did not hear. But she raised her lips again to him, and he drew her closer.

The rain was falling in sheets when Hallett with trembling fingers unhitched his horse and started homeward. It fell perfectly straight, cutting the face like hail. The saddle was reeking, and the mustang's flanks and legs quivered.

Hallett's eyes were half shut. The horse, left to itself, lashed furiously over the familiar trail.

At the top of the ascent Hallett stopped, where he had stopped before, and dismounted. Behind the fallen trunk of the tree was a pile of granite rocks, and behind this he fastened his horse and went back and sat down on the tree. His mind was made up on one point. He would wait there for Jim Merle, have it out with him out there in the open. Two men and one woman—that was out of the question.

The rain, which had been nine months in the coming, seemed to have accumulated nine months of strength for this initial downpour, and Hallett was soon soaked to the skin.

He got up and looked round for some more sheltered spot. There was none. Somewhere behind the rocks his horse was whinnying. He came back to the tree and seated himself again. It was a prodigious trunk, large enough to hold a bigger man than himself inside. The idea occurred to him, and he lay on the ground and pushed his way slowly backward into the trunk. It was as good a place as any to wait until Merle should come by, until——

"I will give the boy another hour," he thought. Everything was quite clear in his mind by now. His determination surprised even himself. He said to himself, "I must kill Merle!" without any compunction. Love had maddened him, made him unconscious. . . . It was only when he thought of Leicester and Crawford that he felt uncomfortable. He began to wonder whether they would wash up for dinner, and laughed. Then he heard the faint thud of a horse's feet on the sand. He pushed his right hand, in which he already grasped his revolver, a little forward. His position was beginning to grow painful. It was, however, too late to change.

The sound of the hoofs grew nearer, but he remained quite quiet, holding his breath. He could hear Merle's voice urging on his mare, and then her white nose came across his vision and, cramped up as he was, he fired—once, twice!

There was a shrill cry, and horse and rider came floundering to the ground.

Everything with Hallett was perfectly distinct: brain and hand worked methodically, as if it had all been rehearsed a hundred times before.

The two forms lay huddled together a few paces from him on the reeking soil.

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He tried to move forward and failed. He tried a second time, and once more failed. A cold sweat broke out all over him. The tree seemed to be holding him in its grasp. A moment's thought might have told him what had occurred, but he was in no state for the consideration of natural phenomena. The thirsty wood had swollen with the rain, and the opening which had been large enough to admit his entrance was now too small to allow his exit.

Years before in days that he barely remembered, Hallett had seen a Norman peasant slowly swallowed up in the sands of Mont-Saint-Michael. The scene came back to him now as if it had been only yesterday. He felt in vain for some knot, some crook against which to get a leverage with his feet, and the hopelessness of it all reminded him of that terrible struggle he had witnessed.

With his right arm, which he had kept thrust in front of him, he tried to gain a hold on the yielding soil. There was, however, nothing to be gained by this. His great shoulders were held in a vice which remorselessly defied his struggles. At last he lay still, panting and exhausted.

After all, he told himself, there was nothing hopeless in his position. Within an hour or so the mailman would pass that way with his team, and would easily find some way to release him.

And then, having reached this stage in his reflections, there suddenly swept across his mind, like a wave flings in the face of a drowning man, the thought that he did not wish to be found; that he could not be found in that position. His eye fell on the black figure of Merle and on the grim outline of the white mare, and a thin, panting cry came from his lips.

From a tiny knot-hole in the wood above his head the rain drops had begun to work their way through. He could feel them falling gently, regularly, and he welcomed them, because his brain was on fire, and his mighty efforts had left him hot and steaming. But after a little while they ceased to feel cold, and it seemed to him as if the rain had suddenly changed to boiling heat. His head began to ache, and the aching spread through his whole body.

The drops fell with a terrible regularity that maddened him. He found himself waiting for each one and flinching horribly as it fell. It was, in effect, as if some imp were pouring molten lead upon him. He tried to get his hands up, but without success. The grip of the wood upon him seemed if anything to grow firmer, and his strength was oozing rapidly. He began shouting for help, but his tongue seemed to grow in his mouth and choke him, and presently he lay perfectly still, listening to the thrash of the water, his eyes always fixed on that melancholy white form and the black figure beside it.

"In a few minutes' time," he said to himself, "I shall be insane." He laughed, because everything about him seemed so life-like and natural; it did not suggest a nightmare; it did not suggest some horrible hallucination. He could see the stripes on Merle's shirt blurring in the rain. He noticed that the back feet of the horse were shod and the forefeet shoeless. And yet the one end was as inevitable as the ceasing of the rain.

It came as it seemed to him earlier than he had expected. He had closed his eyes and when he opened them again Merle was sitting up beside his horse and swearing. He had never believed in ghosts, or shuddered at an apparition, but he had seen and dealt with madness, and he did not try to argue the thing out. Merle got up on to his legs, pressing his hands to his head, staggered a few steps and sat down again.

His action was ludicrous. It even made Hallett laugh. And then it no longer seemed possible that Merle should be dead, that his own mind should be playing him false.

All unexpectedly his voice sounded out like an automaton. "Jim Merle," he called.

The figure beside the horse got up slowly to his feet.

"Hello," he said. He heard Hallett's voice again and Hallett's horse calling plaintively, and went over toward the tree, looking about like a man thoroughly dazed.

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"Where are you?" he called. His foot struck against the revolver, and glancing down he saw the end of Hallett's head just protruding from the tree.

"What are you doing there?" he said.

Hallett's senses were failing him.

"For Heaven's sake, get me out," he cried.

Merle seized him by the arm and tried to draw him out. But he only extracted little groans of pain. There was not room for those broad shoulders to pass.

"Hold on a minute," he said. He went back to where his mare lay stretched in the sand and picked up the saw he had been carrying home. As he stooped he noticed two bullet wounds in the horse's shoulder which were bleeding.

"I must have been stunned," he said. He went back and began releasing Hallett.

"I don't understand," he said in a bewildered tone. "Who did the shooting?"

"I did," said Hallett. "Jim Merle, I'm dying. Be quick, there's a good fellow."

His face was very dark, and his throat was dry and rasping.

When he got out he could hardly stand. Merle was not much better. They both moved unsteadily, and both sat down on the trunk instinctively.

Hallett's horse had got loose and had come round, and was staring at the white corpse, its ears forward, its small nostrils dilated fearfully at the sight of death.

Merle was unable to say a word. As for Hallett, he stooped down and picked up his revolver. He examined the chambers carefully and handed it to Merle.

"I've played my game and lost," he said quietly. "It's your turn now. For every life another!"

Merle laid his hand on the other's arm. The situation was vague, inexplicable, but it was certain that Hallett was a little off his head.

"Come along," he said; "you had better come back and spend the night with us."

A flash of the old fire crept into Hallett's eyes.

"I'm not off my head," he said, fiercely, because he still believed a little in his madness. "I meant to kill you, and then I got wedged, that's all."

Merle glanced at him quickly and a little nervously. The situation was growing impossible.

"I don't know what I've done that you should want to kill me," he said.

Hallett had caught his horse by the bridle, was feeling the girth, and his face was turned away when he spoke.

"I've been a cad, that's all," he said. "Do you see when a man has been out here so long as I have, his soul craves for a little touch of civilization; he longs to come across people who think as he does—who can think. Ladies don't often come our way out here, and— It's no good beating about the bush," he went on, speaking faster, "I am in love with your wife—madly, deeply; deeply enough even to drive me to crime—to murder!"

Merle stared at him, in doubt more than ever of his sanity.

"My wife is in Cairo at the present moment," he said, staring hard at Hallett. "She is not to follow us out till the spring. I don't know what you mean."

"For all that," said Hallett, "some one whom you allow to call herself Mrs. Merle is living with you now—some one who wears your wedding ring!"

"Monica, do you mean!" exclaimed Merle. "Why, my dear fellow, Monica is my step-mother. Married my father two years before he died! My wife—O Lord deliver us!" and he burst into laughter.

While he stood there the moon came out suddenly between a rift in the clouds, and shone down on the two men and the two horses, the one dead, the other pulling at its bit.

It was a tragic bit of comedy; a question solely of relationship.

* * * * *

For a week after the truth became known, Crawford was seen haunting the post-office steps to find Benson, because he said he had paid him five dollars on false pretenses, and he wanted it back. Leicester's idea was to be best man if the wedding came off, which it did.

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WAX INSECT, BEFORE AND AFTER WAXING.

WONDERS OF THE INSECT WORLD.

By René Bache.

Inasmuch as insects are many times more numerous in the world than all other animals put together—comprising no fewer than ten million species, the naturalists say—it is not surprising to find among them some very strange forms, which may fairly be regarded as entomological freaks. A few are remarkable for their great size, others for their dangerous character, and others yet for their mimicry—a power which enables these last, whether for timid concealment or for disguise of wickedness, to counterfeit the aspect of leaves, of twigs, or even of other insects not at all nearly related to them.

To the first of these classes belong the giant spiders, tropical and semi-tropical, known popularly as "tarantulas." They spin no webs, but make for their nests substantial boxes of earth—the particles cemented together with a secretion of their own—with daintily-contrived trap-doors at one end. Such a box looks like nothing but a clod of dirt, its door—held by a strong elastic thread that serves the purpose of a spring—fitting so perfectly that, when it is shut, no trace of an opening can be seen. One species of these huge arachnids, finding flies and other insects insufficient to satisfy its remorseless appetite, makes small birds an occasional prey, leaping upon them and sucking their blood. It is a comfort to be informed that the tarantula, though like all spiders poisonous, has never been positively known to inflict a fatal bite upon a human being.

Though popularly considered as insects, spiders are more properly classified as arachnids, and the same may be said of scorpions, which latter are assuredly among the most unpleasant of living creatures. As might be expected, the largest ones occur in tropical regions, and naturalists say that their stings are dangerous in proportion to the size of the animal and the state of irritation in which it may be. The valley of the Tierra Templada, in Mexico, is specially famous for its scorpions, which are so numerous that it is hardly possible to turn over a log or stone without finding three or four wicked specimens beneath.

The biggest scorpions in the world, however, are natives of the Congo region in Africa, and of these an example, exactly life-size, is shown in an accompanying

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A SCORPION (LIFE SIZE).

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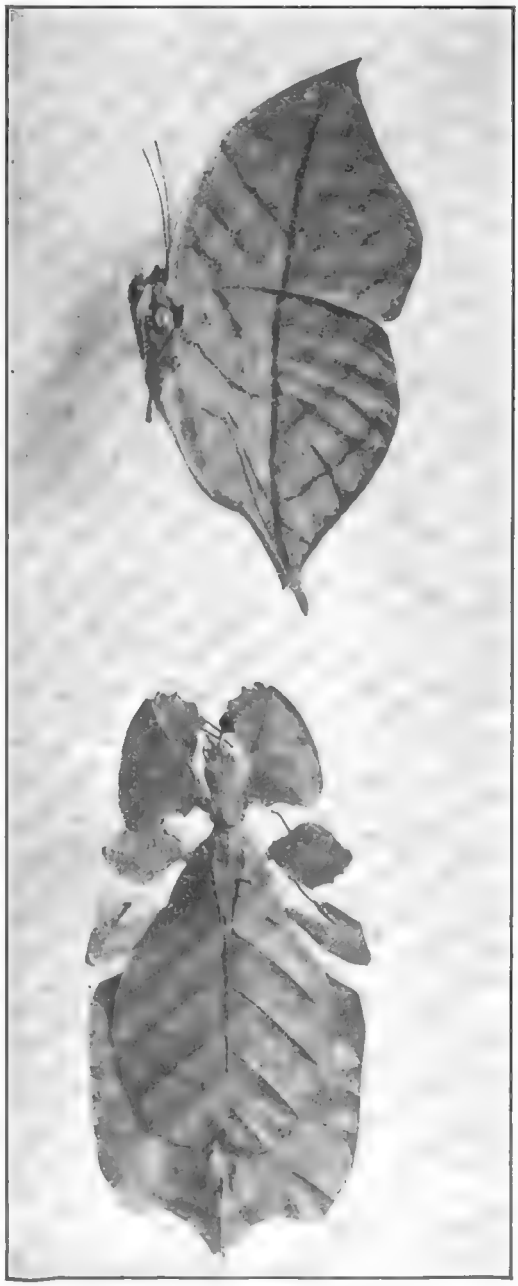
photograph—a very unpleasant customer, one would think, to tackle at close quarters. A poison gland is located in his tail, which he carries curled over his back, and, when he wishes to strike, he snaps it backward at the target, seldom missing what he aims at. As will be noticed in the picture, his caudal appendage terminates in an extremely sharp curved point, which is probably capable of inflicting a fatal wound. Intense pain in the part injured, fever, numbness in various portions of the body, and dimness of sight are among the symptoms which follow such an injury.

One can hardly imagine a more horrible-looking crawler than the huge centipede exhibited in another photograph.

In tropical Africa, where it makes its home under leaves and rubbish, this gigantic species is believed to be very dangerous, but in reality it is not so at all. There are other kinds of centipedes, however, whose bites are decidedly venomous, though the wide-spread notion that the legs of these animals are poisonous, so as to leave a trail that burns like fire if one of them runs over the flesh, is wholly a mistake. All of them, wherever found, are extremely timid, and will not even try to bite if they can get away.

Giants among the Coleoptera are the Goliath beetles of Africa, which attain a weight of a quarter of a pound. Their larvæ—great worms that bore into the trunks of trees—are highly esteemed as a delicacy by the native blacks, who dig them out and eat them. Only a few years ago a beetle of this kind was worth almost any price as a curiosity, but now the haunts of the species are better known to naturalists, and one may buy a specimen for as little as five dollars.

In yet another photograph is shown one of the remarkable insects known in South America as "lantern flies." Even in life the creature looks almost too queer to be true, its huge head being hollow, made of a thin and papery tissue, and painted red and yellow like a toy. At night —the fly is nocturnal in habit—the head is illuminated like a lantern, shedding a light which appears to be of a phosphorescent nature. Professor Langley, of the Smithsonian Institution, says that it is the most economical light known, considering the illumination produced and the remarkably small amount of energy required to make it.



LEAF IMITATING INSECTS (LIFE SIZE).

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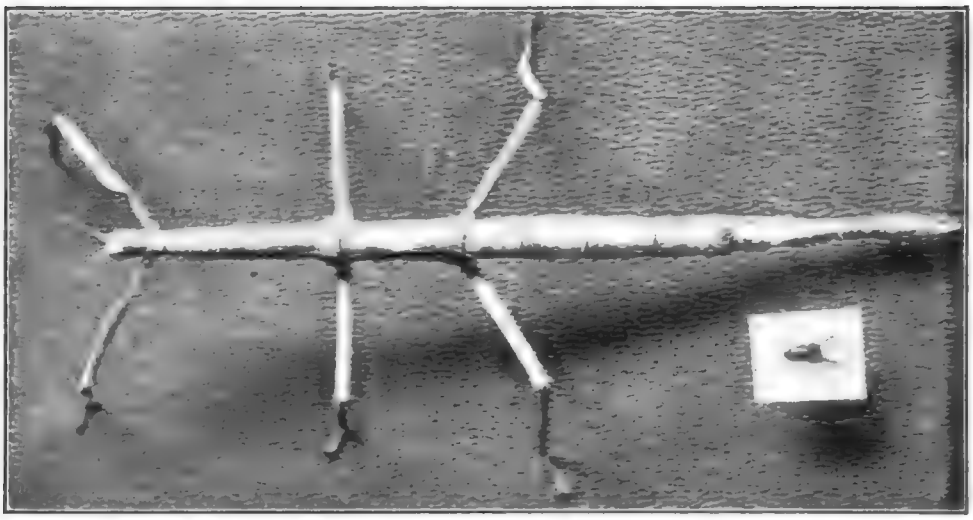

WALKING-STICK INSECT FROM BRAZIL, COMPARED WITH COMMON HOUSE-FLY (ONE-HALF LIFE SIZE).

In Central America is found a very peculiar insect which, apparently for the purpose of disguising itself, resorts to a tree or other convenient shelter, and there proceeds to excrete a white waxy substance in great quantities, so enveloping itself in the material as to be rendered hardly recognizable as an insect at all. The wax is of excellent quality, and the native Indians gather it, boil it, and utilize it in various ways. The two specimens of this creature shown in the photograph may be considered as representing the same animal at different stages of its development.

Among the many curiosities of the insect world there are none more strange and even weird than certain species which counterfeit leaves and twigs for the sake of concealment from their enemies. The so-called "walking sticks" are so like twigs in appearance that the expert entomologist has the greatest difficulty in secur-

AFRICAN "GOLIATH" BEETLE (LIFE SIZE).

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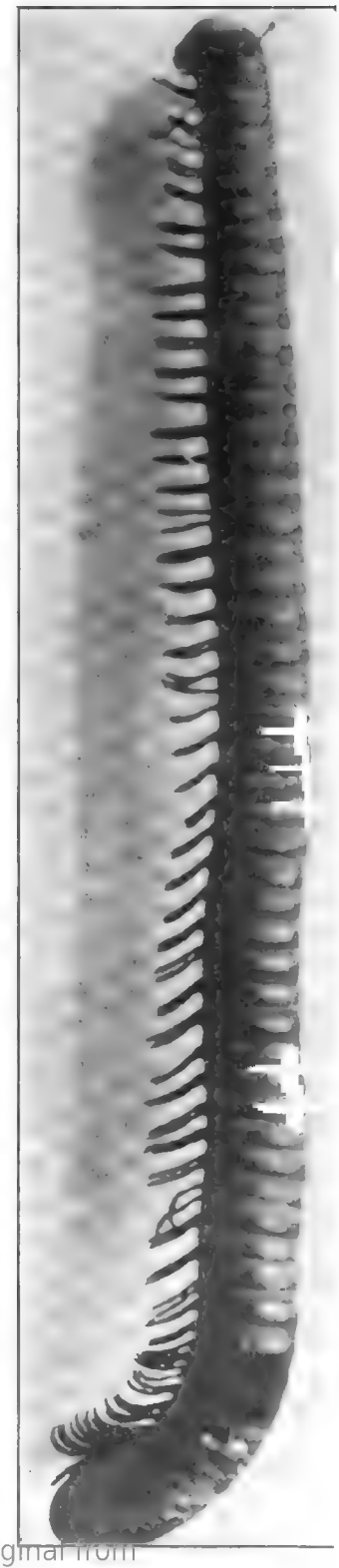
ing specimens, even when he goes hunting for them in places where they exist in immense numbers. They invariably resemble in structure the trees or other plants on which they occur, so that they are to all intents and purposes invisible to the eye, their ingenious disguises rendering them safe from detection. And this is true even of the largest kinds, such as one found in Brazil, which is eighteen inches in length. On certain spiny plants in tropical America big spiny "walking sticks" dwell, adapting their aspect as usual to their environment.

"Walking sticks" are rare in entomological collections, and few persons have beheld more than one or two in their lives; yet the woods almost everywhere in this country are full of them—mostly moderate-sized species, two or three inches long—and they might be gathered readily by thousands if it were not for the disguises they assume. Even the knots of the twig and the appearance of the bark are copied by the insects, so that there is no way in which they may be detected, unless they move, and they are usually stationary or nearly so. Now and then, though very rarely, an imprudent member of the tribe is seized with an adventurous fit and wanders from its arboreal home into a road, thus inviting capture.

Most people are acquainted with the praying mantis—otherwise known as the "rearhorse"—which is a very fierce creature, and apparently assumes a twig-like aspect for the purpose of deceiving its intended victims respecting its character. One must go to India, however, to find those very remarkable species of rearhorses that imitate flowers, their legs and wings being provided with leaf-like expansions which are brilliantly colored. Indeed, when at rest, the animal looks like a beautiful blossom, and simple-minded insects are betrayed by the counterfeit, alighting upon it only to be grasped in a fatal embrace and torn to bits.

In tropical countries are found a number of species of insects that counterfeit leaves in a wonderful way, and some kinds among them are said actually to assume in dying the changing hues of the decaying leaf. Their coloring-matter has been subjected to analysis, and has been proved to be practically the same substance as the chlorophyl which gives the green hue to living leaves. It is not, after all, so very surprising that the untutored natives of regions where these creatures abound should believe, as they commonly do, that they are in reality transformed leaves—in other words, that a bud developing into a leaf becomes at length a leaf insect by a mere change of habit.

Most remarkable of all insect imitators are the "walking leaves" of Java, which are relatives of the katydids. Indeed, the katydids themselves simulate green leaves quite wonderfully.



A CENTIPEDE (LIFE SIZE).

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This kind of imitation is not uncommon, and one of its most notable examples is found in a tropical "leaf butterfly," on whose wings when closed the very ribs of the leaf are counterfeited. The very manner of flight of some of the leaf-mimics resembles that of a falling leaf, so as to lend additional deception. There are some insects of prey which assume the aspect of harmless insects in order that they may be enabled to approach their victims without causing alarm, and one might cite many other curious examples of the working out by Mother Nature of a system of deception and false pretences in this humble branch of the animal kingdom.

LANTERN FLY OF SOUTH AMERICA.

One of the most curious of popular beliefs regarding insects is one to the effect that certain species of beetles actually contain appreciable quantities of gold or silver, which may be obtained from them profitably if proper methods are followed.

The best-known gold-producing bug is the golden rosechafer—a very handsome yellow beetle, with a metallic lustre, about as big as a man's thumb. On the other hand, if you want silver, one of the most available insects is the "silversmith," which is common in cottonwood trees, resembling a June bug. These beetles are frequently smelted for the precious metals they are supposed to contain, and if the result is not a success, it is always taken for granted that something was wrong with the process.

The finest gold bugs are found in Central America, belonging to the genus Plusiotis, and one might easily imagine a specimen to be the work of some clever artificer in metal.

TARANTULA ATTACKING A YELLOW-BREASTED WARBLER.

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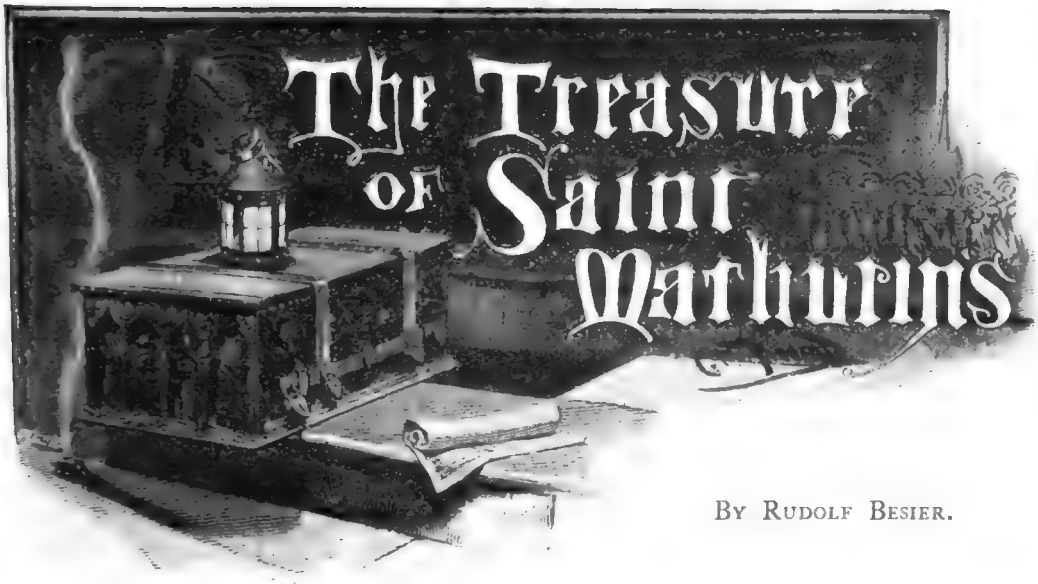

By Rudolf Besier.

I.

The door opened softly and the poet entered; on tip-toe he crossed the room, and with an air of profound mystery put his lips to little Thibault's ear.

"*Mon cher petit*," he whispered, "if untold wealth were placed in your hands, would you pitch it out of the window?"

"Eh, what?" He dropped the implement he was polishing, and a look of annoyance augmented his natural ugliness. He hated the poet's idle chatter; he was a busy, practical man of the world, was little Thibault.

The poet repeated his mystic query.

"Fool!" and little Thibault resumed his work, the scowl fixed on his face.

But, quite unabashed, the poet squatted tailorwise on the floor in front of him.

"Little man, you are beautiful as a gargoyle of Nôtre Dame," he said earnestly, with a languishing glance; then on a sudden, in a tone of business-like directness: "Friend, I have discovered a certain clue to the hidden treasure of Saint Mathurin's church."

It was Villon who spoke, François Villon, *alias* François de Montcorbier, *alias* François des Loges, *alias* Michel Monton-Villon, the ribald songster, the beautiful balladist, the scamp, the brawler, the housebreaker, Villon, who else? You knew him at a glance by his easy, slouching figure, his wild red hair, loose lips, and great insolent eyes. The pride of a notorious gang whose daring robberies shocked the sanctimonious people of Paris—they were quite as sanctimonious in the Middle Ages as they are to-day—Villon owned allegiance to none save only to the Muse of Poesy, into whose lap he pitched his naughty rhymes, and to the merry god Bacchus, whom he never wearied of pledging in red Beaune. As for Thibault, the truculent little rascal, his position in the gang resembled St. Peter's among the blessed saints: he kept the keys, or, to be more accurate, the pick-locks. Dwarfed, ugly, ill-tempered, but as perfect an artist in his peculiar line as Michael Angelo in the art of sculpture—such was little Thibault; and not even the intricate lock on the gate of the Inferno (so Villon was reported to have said) would have power to withstand his skill, though guarded in person by the Prince of Darkness.

"My friend," repeated the poet, "I have discovered a certain clue to the treasure of Saint Mathurin."

Thibault looked up sharply, but said nothing; the scowl had passed from his

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face, and his eyes grew brilliant and eager as the eyes of a rat.

"Listen!" Villon went on. "Last night I supped with Dom Nicholas of the Franciscans. You know him? A friar of weighty proportions and most saintly piety, albeit not a whit contemptuous of goodly cheer; one that empties his flagon with true feeling and a full appreciation of its divine properties—a man after my heart. Well, last night he acquitted himself heroically. *Ventrebleu!* he might have drowned in the liquor he swallowed; and the good wine loosened his tongue—his even, a tongue too fat by nature to wag with ease. We discoursed of sundry matters, and I bemoaned the ill-luck that doomed me to live a poor man.

"'Ah, my son,' he said, 'were I unfrocked and a knave, I might with ease be as rich as any man in Paris.'

"'Oho!' thought I, 'the old badger has feathered his hole against evil times. I must hear more of this.' So I filled his cup, and with all reverence expressed myself incredulous. That put him on his mettle, as I calculated, and he snapped at the bait.

"'Eh?' he spluttered. 'You doubt it? Very good. But look you,' he says, 'I know where a priceless treasure lies hidden. Holy saints, and such a treasure!'

"'Marvellous!' I retort, and smile and shrug my shoulders.

"'Marvellous it is!' he snorts, waxing red as a beetroot. 'Very good. You think yourself wise, eh? Then look here.' And the old fool produces a folded parchment from a pocket wrought into his inner vest just above his heart. 'With this to guide me,' he says, 'I could pick up seven golden chalices, seven golden plates, seven golden censers, seven golden crucifixes, and all of them encrusted with great gems.'"

"*Mort de ma vie!*" ejaculated Thibault. "The treasure of Saint Mathurin!"

"Truly," cried the poet, with climbing excitement. "And 'tis waiting for you and Tabary and me. Nicholas sleeps and wakes with that parchment on him. We must get it. Oh, *mon cher petit*, we shall grow fat at last!"

"Twist the friar's neck?" queried the practical Thibault.

"Fie, man! And you an artist!" cried the poet, deeply shocked. "Such methods! So gross! so barbarous! And think of the unnecessary risk! No, no. But we must extract the parchment from its hiding-place, copy it, and return it, without the good saint having the least suspicion of the transaction."

"Very pretty," sneered the other. "But how?"

"How? You dull-witted little pick-lock! Have I not said the worthy father is partial to good cheer?"

"Well?"

"Well? Well? Dolt! Give him as much red Beaune as he can put away, and mix a sleeping draught with it." A light dawned on the little man's face. "Listen," continued the poet rapidly. "I shall invite the old pig to sup with me at 'The Mule' to-morrow. You and Tabary must be there also. He will sleep; we shall get the parchment, copy it, and replace it before he wakes. The rest is child's work."

The little man grinned and nodded, and rubbed his long bony hands.

"Dear saints," said Villon solemnly, leaping to his feet, with hair flying, "I thank you for my genius." Then suddenly embracing his companion: "Adieu, my beloved, I go to the good father."

With a long stride he precipitated himself out of the room, but the next instant his flaming head was thrust in again.

"Bring your tools with you to-morrow night."

"Eh? Why?"

"Your tools!" shouted the poet, as he leaped down the rickety staircase four steps at a time.

II.

A DARK ramshackle structure in the vilest quarter of Paris, "The Mule" tavern was remarkable for nothing save its sign-

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board, which showed a crimson mule rampant upon azure clouds. "A perfect portrait of my Pegasus," so Villon is said to have commented on this striking work of art.

In a dirty, low-ceiled room on the first story sat the three conspirators—Villon, Thibault, and Guy Tabary, the last a pale lanky fellow of small wit, but devoutly attached to the poet; his *aide-de-camp*, so to speak, and best pleased when most bullied. Facing them across the table sat Dom Nicholas. A great fire roared up the chimney, and two torches attached to the chimney-piece flared redly on the table with its platters and goblets, and threw weird shadows on the grimy walls, while without the fierce breath of December howled like a tortured animal.

SUDDENLY ABOVE THE SCREAMING WIND ROSE THE FIRST SNORE.

No one spoke. The moment was intense with bridled excitement, for the plot had succeeded. Not ten minutes since Villon had mixed a drug with the good father's wine, the potion was doing its treacherous duty, and six distended eyes were fixed on the unlucky saint. Seated well back in his chair, he was, in truth, a vision of dread and wonder, his hands folded on his ample waist, and his small, round mouth opening slowly while his head fell jerkily backward. Suddenly above the screaming wind rose the first snore.

Tabary giggled in an ecstasy of triumph.

"Silence, fool!" hissed little Thibault, with a savage glance.

Softly Villon rose, and, stealing up to the priest's side, examined his silly features.

"Gentlemen," he said, with becoming gravity, "the saint sleepeth."

Tabary leapt up from his seat with a guttural ejaculation; but the poet, deftly leaning across the table, nipped his ear and forced him back into his chair.

"Down, Guy!"—as though he was addressing a dog—"and keep a still tongue."

Rapidly his large hands went to work on the unfortunate friar; the others watched breathlessly. What if the parchment were missing? But no; a nod from Villon reassured them, and the next moment he drew forth a folded sheet. Thibault was beside him in an instant and examining the prize. A blank look came upon their faces—the parchment was sealed.

With a muttered ejaculation Villon

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grasped the dagger at his belt. Thibault's hand arrested him.

"Art mad?" he whispered. "We must break the seal, and secure the treasure to-night. No time to copy the plan. Were he to find the seal broken before we had the treasure he might warn the Bishop. We must take this with us to Saint Mathurin's, finish the work, and return the thing to his pocket before he wakes. He will sleep till morning."

"When he finds the seal broken, and hears of the missing treasure, he may accuse us to the Bishop."

"Tut, man, he would never dare. We should simply deny."

"True."

The poet broke the seal, and four eyes devoured the parchment with brilliant satisfaction.

"Right!" was little Thibault's comment. "We start immediately. The church-door will be locked at this hour of night. Lucky I brought my tools!"

"Poet and prophet I—*Ciel!*—" With a huge thud that shook the house to its foundations, the unconscious priest had tumbled from his chair on to the floor. Tabary started from his seat with a terrified yell, and the three conspirators stood glaring down on the fallen. Heavily groaning, the wretched man essayed to rise, and clutched the vacant air with a blind hand. Both Villon and Thibault grasped at their daggers; but gradually the recumbent bulk subsided, and the groans merged into snores, reassuring, sonorous.

"Ah!" breathed little Thibault, the color returning to his lips.

Tabary laughed hysterically.

"May the good saints hallow with virgin dreams thy slumber," said the poet solemnly. Then, with a sudden laugh: "And lest thou shouldst hunger vainly in the morning—this!" And seizing a bowl full of Dutch herrings floating in a savory sauce, he emptied the contents into the monk's hood. Tabary bent double with convulsive laughter, and even little Thibault sniggered appreciation.

"François, thou crazy varlet!" he gasped. "But let be. Come!"

Laughing, they extinguished the torches and stole down the stairs, but before quitting the tavern, they bade the landlord leave the good father undisturbed until they should return. Then the night swallowed them, and up-stairs Dom Nicholas snored a solemn accompaniment to the choral wind.

III.

Lost in the snow and the darkness, the steeples of Saint Mathurin's church shrilled to the driving storm. In corners of the streets the snow lay in deep drifts, and so harsh was the wind that, despite the goodly supper they had washed down with red Beaune, our three worthies felt their ardor somewhat cooled by the time they arrived at their destination.

"Now," said the poet in a rapid undertone to little Thibault, "while you open that door, we two will keep watch, each fifty yards away to right and left. Should the patrol heave in sight, we whistle. Keep your eyes open, Guy."

Poor Tabary shivered and nodded; he devoutly wished himself back in the hospitable "Mule."

So they separated, each man to his post. There was little danger of interruption, the good citizens preferring their warm beds and firesides to the inclement weather, and the patrol—for even the patrol are human—haply warming their vitals in some friendly tavern. But little Thibault was unconscionably long at work. Perhaps the bitter cold numbed his cunning fingers. An hour slipped by, and still he made no sign. The frozen sentries discerned him dimly through the veiling snow as he picked busily by the faint light of his lantern. Villon began to stamp about and beat his arms against his sides. Tabary, all doubled together, crouched for shelter against the wall. Another half hour, and still no sign. Tabary's meagre sense was forsaking him; Villon, with muttered profanities, was on the point of forsaking his post.

At last Thibault waved the lantern. The poet, with a few strides, gained the porch.

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A GREAT MELANCHOLY CRUCIFIX GLIMMERED DOWN UPON THEM.

"*Peste!* You lazy little villain!" he cried hoarsely. "I am a stone! I am an icicle! Is't open?"

"Yes."

"Guy! *Pardieu*, where has the skulking ass betaken himself? Hist—Guy!"

"He—he—here," quavered the wretched Tabary as he crawled into sight, the chattering of his teeth audible ten yards away.

"Look alive, dolt!" growled the poet, thumping him on the back. "Look alive, goat!" seizing him by the gullet and shaking him till he gasped for breath. "So! Now listen. While we are inside you keep watch. Stand against the opposite wall directly facing the porch, and keep your eyes open."

"Ah, no!" whined the unhappy Guy. "Let me in, François, I pray y—you! I am dy—dying of—ff co—cold."

"Then, by my faith," returned the poet cheerily, "I have a mind to warm you till you yelp for the cold!"

That was amply sufficient. Tabary made for his post double quick.

The others pushed the door open, entered, and closed it carefully behind them. The darkness was absolute, and, though intensely cold, the atmosphere, being free from wind, was grateful to their tingling skins.

By the lantern's feeble glimmer they picked their way carefully up the aisle. No word was spoken until they came to the altar steps; then Thibault asked for the plan, and, crouching on the steps, they bent their heads over it in the dim light.

"See, it lies beneath the second step," whispered Thibault, pointing to a red cross on the plan; "and the clue is somewhere on the altar—a knob, doubtless, to be pressed or pulled. Come!"

They climbed the steps, and, light having been thrown on the altar, both rascals peered, and on a sudden started back with smothered exclamations, and crossed themselves with fearful fingers. A great melancholy crucifix glimmered down on them from above. Villon stood awhile motionless, his wide-opened eyes fixed, as though entranced, upon the holy image, the enormity of the intended sacrilege stealing over him with a vague, spiritual terror. For a moment the inclination possessed him to

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turn and fly. But little Thibault was already peering and poking among the candlesticks and vases, no man less impressionable than he.

"I see nothing," he growled hoarsely; then, getting no reply, turned about abruptly, flinging the light on Villon's white, upraised face.

"François," he whispered fearfully, "François!"

With an effort the poet shook off the terror that held him.

"What?" he faltered, advancing unsteadily.

"The clue—I—" stammered Thibault with dry lips, for the other's eyes were full of a wild light, and his face livid with passion.

Suddenly Villon burst into a fierce, ugly laugh. "By all that is holy!" he cried, "if we are to be cursed—so be it. Out of the way!" and pushing Thibault roughly aside, he snatched violently at the crucifix on the wall; but instead of coming loose, it slid a foot downward, as though fixed in a groove. He leaped back, his hand still poised in the air, and the blood rushing to his face.

There was a moment's silence. Then little Thibault, familiar with the poet's unaccountable moods, having recovered his equanimity, warily turned the light about him and peered into the darkness. His eyes fell on the second step, and, quick as lightning, his left hand closed on the poet's arm.

"François—see! see!" he cried. "The crucifix was the clue."

He pointed to the second step, of which the upper slab had fallen in, revealing a dark cavity some two yards in length. In an instant he was on his knees beside it, and his hand plunged swiftly into the blackness.

"Holy saints, 'tis here!" he gasped. "I feel it—a coffer. *Oh, mon Dieu*, 'tis heavy!" With set teeth he essayed to haul out the prize, swearing the while and praying, like one demented.

Then Villon with an excited laugh, his weird seizure gone like an April storm, pushed the gasping little rascal aside, and with a strong effort hauled out a high, long coffer.

"It is locked," he panted.

"We must take it as it is," said Thibault, staggering to his feet.

But he reckoned without his host.

DOM NICHOLAS SAT IN THE CENTRE OF THE FLOOR AND GLARED ABOUT HIM WITH DAZED, BLOODSHOT EYES.

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IV.

THE worthy landlord of "The Mule" had fully intended to carry out Villon's instructions, and leave Dom Nicholas in undisturbed possession of his holy dreams; but the unexpected arrival of sundry wayfarers drove all else out of his mind, so that he neglected to communicate the pressing injunctions to his excellent spouse. She, accordingly, some while after the guests had left, armed herself with a tray and repaired to the room they had vacated, in order, as was her wont, to clear the board.

There was no light in the room save that supplied by the glowing embers and fitful flames of the hearth, and in the ruddy dusk the good woman set to work putting the bowls and platters on the tray which she supported against her hip.

"Even the fish!" she grumbled, removing the empty herring-bowl. "But what would you? Those priests could swallow their—"

Here her foot, coming in vigorous contact with the recumbent father's head, elicited a mysterious snort.

"*Sacré nom!*" she gasped, jumping back and letting the tray with all its burden fall on the unlucky saint.

With a dreadful bellow he rolled his huge bulk into a sitting posture and struck out blindly with feet and hands. In the doubtful gloom he was but vaguely perceptible, and the poor woman, unstrung already, lost all control of her nerves, and filling the house with terrified screams, made for the door.

WITH GUTTURAL SCREAMS HE OUTSPED THE WIND.

"It is a bear!" she cried hysterically rushing into her husband and clutching his arm. "Oh, Jean, a bloodthirsty bear."

"*Diable!* Thou vile woman! I am undone indeed!" and seizing a torch from the mantle he sprang up the stairs.

Snorting like a grampus, Dom Nicholas sat in the centre of the floor and glared about him with dazed, bloodshot eyes. The landlord prostrated himself with vehement apologies, but the luckless friar neither pardoned nor upbraided; he only glowered around in shocked bewilderment. Fully awakened by the harsh treatment he had undergone, his dense mind was laboriously unweaving the tangled threads of recollection. He began to groan and mutter disjointed phrases, then suddenly be-

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came silent. A clear thought struck along his brain. He thrust an unsteady hand beneath his cassock, and fumbled in search of something with ludicrous haste.

It was gone! His agitation was fearful to behold; his imprecations shocking on the lips of a saint.

"Villain!" he roared, shaking his fist at the landlord and attempting to rise, but falling back heavily. "Thief! Give it me—my plan! My treasure! Oh! Oh! Give it me back!"

"By all saints, I swear—" began the other, but fell back amazed.

For Dom Nicholas had come on daylight. All at once he remembered having shown the parchment to Villon; dimly he discerned the purpose of the supper. He had fallen asleep; he had been robbed; Villon and his companions were sacking the church.

With a huge effort he gained his feet, and, choking and storming, rolled to the door and down the stairs and into the street. The icy wind met him and buffeted him, and dazed and unsteadied, he reeled sideways against the wall. Recovering, he pressed onward as fast as his bulk would allow in the direction of Saint Mathurin's, filled with tempestuous determination to prevent the robbery, or, at all events, secure a share of the booty.

What might have occurred had all things run smoothly I dare not conjecture, but the crowning mishap was yet to come. Having put behind him half the distance, he was, perforce, slackening his pace through sheer lack of breath, when all at once his ear caught the patter of rapid steps and the hard panting of some pursuer close upon his heels. Now, the street declined somewhat steeply, and the luckless priest, much as he wished to draw up, had to continue his downward course, a bulk like his when once set in motion being a thing defiant of all control. But he glanced over his shoulder as best he might, and, dear heavens! the shock that glance gave him.

Three great beasts, their fangs gleaming, their eyes glowing, were full on his track.

Until that moment the well-favored saint had never gauged his athletic capacities. With guttural screams he outsped the wind. Through his terrified mind reeled horrid tales and grisly memories. One severe winter in his childhood, wolves emboldened by famine had devoured children in the very heart of Paris. These frightful beasts were wolves beyond the cavil of a doubt—wolves that thirsted for his blood!

He gasped and gabbled the name of every saint that occurred to him; he prayed brokenly; he swore to do every imaginable penance for all his little sins. Let Heaven but preserve him, he would fast five days a week and abjure the use of wine until his dying day. Ah, by Saint François, he would don a hair shirt and never wash himself for ten years!

It was, in sooth, an uncanny spectacle that suddenly rolled upon Guy Tabary as he crouched dutifully outside the porch, and blew on his frozen finger-nails—a wild spectacle, and full of strange noises, indefinable in the starless gloom, but pregnant with hideous possibilities. The poor man lost his nerve completely, but, faithful to his duty, made for the church-door, thrust his head in, and yelled the first word that came to his mind:

"The patrol!"

Villon and Thibault had just lifted the coffer between them as the dreaded cry shrilled up the aisle. They dropped it with a clatter on the altar steps.

"Out with the light!" whispered the poet.

Thibault flung it with all his force against the floor. At the same moment the door was violently flung open and the darkness filled with a blood-curdling din.

"*Mon Dieu*, they have loosed the dogs on us!" gasped Thibault.

"We must run for it!" hissed the poet. And with simultaneous accord the two worthies made a headlong dash down the aisle, coming half-way in tremendous contact with the luckless friar. Villon struck fiercely at his invisible foe, overturned him, and leaped out into the night, little Thibault panting at his heels.

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But all motionless in the dark church lay Dom Nicholas, and over his prostrate form the dreadful animals growled and fought.

V.

When the gray dawn glanced coldly through the high church windows, the friar lifted his eyelids, gradually sat up, and looked cautiously around him. His first conclusion was truly sensational; he was whole and not devoured. All praise, therefore, to the good Saint François, who had intervened and saved him from the ravening wolves! Because the friar's hood had been emptied of those Dutch herrings, we surely have no right to conclude that the wolves were mere dogs, ravenous, and attracted by the smell of fish. No, no; to Saint François be the credit!

His second conclusion was that he had, all unconsciously, averted the infamous theft (though, indeed, here, too, the credit may be due to Saint François), and had regained, moreover, his precious plan. For here lay the coffer at the foot of the altar, and beside it his lost parchment.

Then he rose, and, having offered a devout prayer of gratitude, returned both objects to their respective hiding-places.

After which he ambled homeward, and let us hope that he fulfilled those pious intentions made in the hour of peril—that he fasted with diligence and abjured wine; that he wore a hair shirt, and avoided washing himself for ten years.

A SONG OF SUMMER.

Adown the stream my skiff I steer,
The laughing waters kiss the prow,
The swallows dart, now far, now near,
The quivering sedges to me bow.

The low of cattle, hum of bees,
Makes music in the sun-drenched air;
The whispering branches of the trees
Sing songs of summer passing fair.

No city's smoke to mar the sky,
No sound of traffic strikes the ear;
The hush of nature gives the lie
To any thought of turmoil near.

Behind the hills the sun slips down,
His path a sea of glorious gold;
The joy of evening is the crown
Of day, with glories still untold.

Richard Bird.

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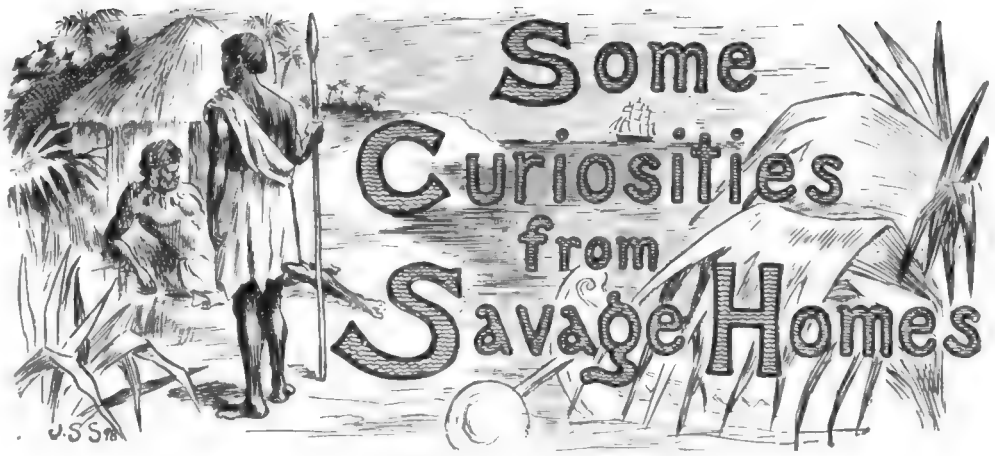

By M. Burnley.

The study of man's home reveals many secrets, lays bare his predilections, habits, and occupations, and this handful of curious household treasures collected from savage homes of many nations will make us familiar with some quaint customs. Whether the hut or home be large enough to hold ten or twenty persons, or only three or four, whether it be on the ground or built on piles, the household god is the first and most important object therein. The grotesque figure here shown, really only a bust, comes from New Hebrides, and is made of pith and vegetable fibre coated over with clay and painted in gray, picked out with black and white, the arms being outstretched as if in the act of benediction. This god would have the place of honor assigned him in the hut on one of the rafters, or on the ground in a separate part of the house partitioned off from the ordinary dwelling.

A HOUSEHOLD GOD FROM THE NEW HEBRIDES.

It is made of pith and vegetable fibre, daubed with clay, and painted.

Some tribes lavish a great deal of rough skill on their cooking and eating utensils, while others again are satisfied with the most primitive contrivances. The food bowl next illustrated, from the same islands, is curious, not only from its being made in the semblance of a pig, cut out of a solid block of wood, but also from its symbolic meaning. The natives of

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This is a food bowl from the New Hebrides, and is supposed to represent a pig. Pigs in these islands are of value, for nothing of importance is done by a native without the giving or the killing of a pig, or number of pigs.

the New Hebrides are not gluttons by any means. They feed chiefly on a vegetarian diet of yams, bread, fruit, bananas, sweet potatoes, oranges, etc., with the addition occasionally of fish and mollusks. But the gala dish is pig, and no festival is complete without it; in fact, this animal may be said to trot steadily through life side by side with the native of the New Hebrides.

A few days after a native's birth, a killing of pigs takes place, and the baby-boy thenceforth assumes the rights and privileges of a man, and is obliged to have his own fire and meals, and to feed only on male creatures, otherwise death will ensue. The feast of naming is a very solemn occasion, and, of course, gives opportunity for a pig feast. When the youth is invested with the belt, a ceremony which takes place from the age of fifteen to twenty, more pigs are killed. When he chooses his betrothed wife, many ceremonial visits are paid, accompanied with a gift of pigs.

Marriage, including the net cost of the wife, who is worth, according to her beauty and her capabilities as a worker, from ten to twenty pigs, costs a would-be husband no less than fifty pigs. Besides these occasions, all religious festivals are accompanied in the New Hebrides by the slaughter of at least one or two hundred pigs.

The hut of the Fijian has some pretensions to durability and comfort, and the interior presents quite a furnished aspect; in fact, it looks really more like a home than is usually the case with these savage dwellings.

A FIJIAN PILLOW.

The trough is made to contain offerings calculated to propitiate the spirits, and thus protect the sleeper and prevent any spells being cast over him.

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Part of the floor is used to form a dais, which is by day the divan and by night the bed of the house; and very comfortable the bed looks when it has been made. A thick layer of dried grass and elastic ferns is spread, forming a soft spring mattress which is covered with from two to ten mats. Over this hang sheets of thin *masi*, which are used as mosquito curtains, and are usually long enough to stretch across the house. The bed furniture is completed by one or two wooden pillows like the one shown on the previous page, which is made of heavy brown wood, and consists of a boat-shaped trough on four legs, and of a cylindrical rail supported on two uprights.

This pillow is dedicated to the spirit, who must be propitiated so that he play no evil tricks on the sleeper, and cast no spells over him, for the religion of the Fijians is one of spirits, and he is no worshipper of idols. The trough is therefore kept well filled with tobacco. The Fijian is obliged to use this hard and uncomfortable looking article for a very practical reason. His mop-like headdress would be entirely spoiled and pressed out of shape were he to rest his head on an ordinary stuffed pillow.

This is a Fijian hook, cut out of a solid block of wood and used to hang food up out of the reach of the swarms of ants that infest the native dwellings.

Another curious looking object has also been obtained from a Fijian house. It is a hook used to hang the food up from the rafters out of the way of the swarms of ants, which infest the native dwellings. It has been cut out of a solid block of wood, and consists of a cylindrical central shaft terminating in eight hooks, which resemble the petals of the water lily slightly upturned. At the opposite end is a projecting dish with a groove in the center and notches cut round the edge. It is pierced to receive a loop of plaited sinnet cord.

The Nicobars consist of a group of eight large and a dozen or so small islands in the bay of Bengal. Some of these islands are distinctly minute in size, and this can the more readily be appreciated when it is stated that the largest of all is only thirty miles in length by fifteen in width. Naturally they are clothed in vegetation, and can even boast a certain amount of trade. The natives have nowadays quieted down into fairly respectable members of the world's society, but formerly they had an evil and thoroughly well-deserved reputa-

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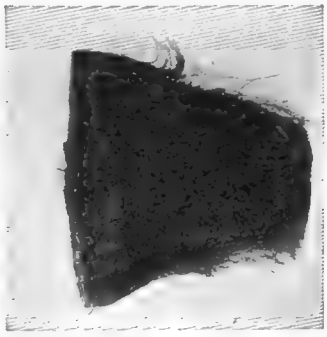
A toddy kettle made out of a cocoanut and a piece of bamboo, and used by Nicobar natives for "tari," or toddy.

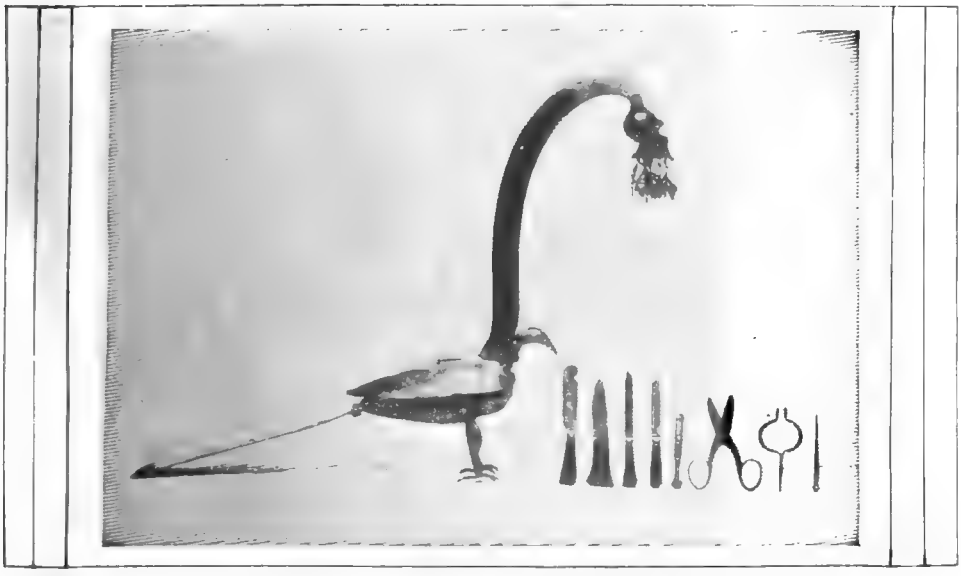
tion for playing the part of pirates. More than one good ship fell into their merciless grip, the crews being cold-bloodily butchered. Matters reached such a pass, indeed, that the Indian Government, in 1869, interfered, with the result that the group was annexed, the government being placed under the control of the Superintendent of the Andaman Islands.

The natives are in appearance hideously ugly, short and squat; in fact, they look pretty well as bad as they are, their ill looks in no wise belying their moral or immoral character. Their habitations are, however, interesting and ingenious, being raised on piles about ten feet from the ground and entered through a small trap-door by means of a ladder which is drawn up at night when the family retires to rest.



A footbrush from the Nicobars, made of pandamus, and used by natives before entering a dwelling.

The curious kettle from one of these dwellings which we have selected is connected with many strange rites and ceremonies, as well as with the daily life of this lazy tribe, whose great vice is drunkenness. The kettle is made of a cocoanut shell with



A Nepalese dove made of metal. It is a cucumber slicer, but it contains inside it all the various implements depicted. The big curved blade is drawn out from under the bird's wing.

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A looking-glass in a red-painted wooden frame from the Niger country.

a thin bamboo spout, and it is used for pouring out the filtered tari or toddy into the drinking cups.

At the feasts held to drive out the demons, partly by gifts and partly by force, this toddy kettle plays a great part; for the priests and the men sit smoking and drinking in silence, while the women walk round with these vessels, filling up the drinking cups as fast they are emptied. The exorcism cannot begin until the priests are drunk with toddy.

Every housewife will appreciate the footbrush from the Nicobars, made of pandamus, from which the pulp has been extracted, leaving a sort of little brush-like whisk. Two or three of these brushes are kept at the door of each hut, and in response to an invitation not to wipe his feet on the mat, but to clean them with the brush, the visitor squats on the floor round the trap door, and vigorously uses this very practical toilet article, after which he is allowed to enter, and is made welcome and treated to toddy.

The harmless looking little dove taken from a Nepalese house almost rivals the wooden horse of Ulysses in hidden surprises of an aggressive nature, and is a *multum in parvo*, the compactness and ingenuity of which might excite the envy of a housekeeper. This dove is a cucumber slicer, and is really more to be pitied than the charming "tit-willow," for the knives, scissors, tweezers, file, etc., shown in the illustration, all come from "her little inside." From under her brass wings is drawn out the elegantly curved steel knife, finished with an additional bird's head with brass and bead pendants, which forms the actual slicer. When at rest, it lies over the blue steel tail of the bird.

From India we turn to Africa, and there, in a settlement on the western coast, we find the curious mixture of European and native workmanship here shown, which is highly prized in the Niger country. It consists of a shockingly poor looking-glass in a common

A Matabele pillow, the carvings being stained black, the natural color of the wood showing in the incisions.

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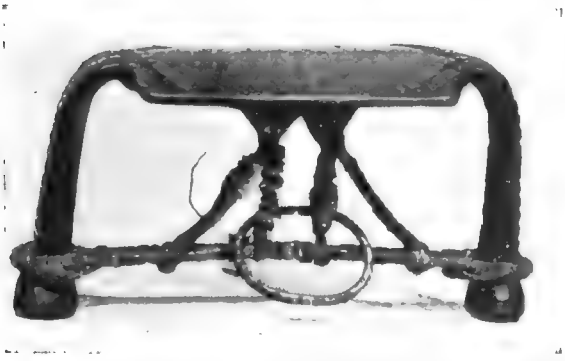
A LOANGO SPOON.

Loango is on the west coast of Africa, near the mouth of the Congo.

red-painted wooden frame, which is an article so much coveted by the natives that it forms a medium of barter, and has been thought worthy of this ornamental wooden frame with cruciform handle.

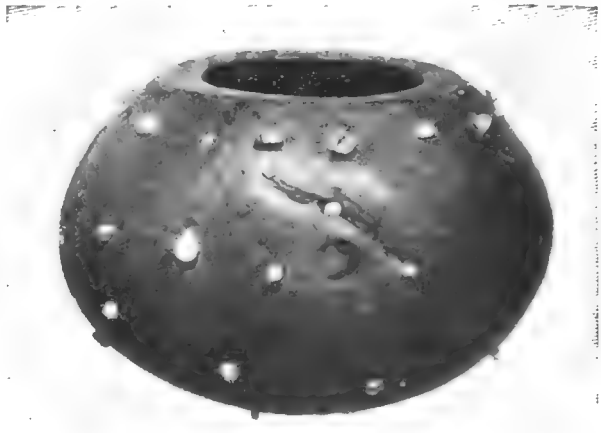


This is an African seat. It is inlaid with brass, and the ring is made of iron. In some parts of Africa such a seat forms the king's throne, and is always carried before him.

A pillow used by the Matabele is more ornamental than that of the Fijians, but at the same time simpler in construction. The carving in the shape of lines, pellets, zigzags, and disks is stained black in relief, showing the natural buff color of the wood in the incisions.

Spoons are not usually very interesting utensils, but the present specimen is an exception to the general rule. It is carved out of hard brown wood, and the bowl has a ridge down the center, which makes a double spoon of it. The shank is flat and wide, and on it are carved two negroes carrying in a hammock a man naked like themselves.

Loango is a stretch of country on the west coast of Southern Africa. It extends northward from the mouth of the Congo, and is inhabited by a rather fine type of negro. Their religious rites, however, are terrible —in fact, to such an extent do they carry their religious zeal that for every person who dies a natural death four perish by what is known the *cassa* ordeal. Matrimony is encouraged, and the proud parents of Loango set forth any marriageable daughter they may chance to possess in small cages or bowers erected in front of the parental abode. The loveliness of the dusky maiden is supposed to be much enhanced by hav-



A spittoon once belonging to the king of the Sandwich Islands. The bowl is of wood studded with human teeth—those, in fact, of enemies slain in battle.

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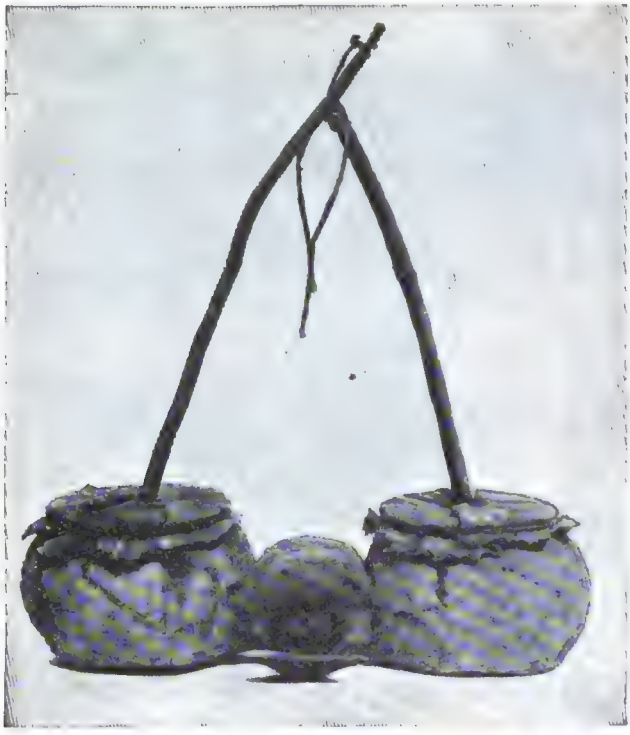

A PAIR OF WEST AFRICAN BELLOWS.

The body is made from solid wood. The blast of air is caused by lifting and depressing the loose skins at the top of the wooden globes.

ing the skin stained a peculiar red color.

All eating utensils are invested with a horrible interest in a country like Loango, where whoever may see the king eat or drink is put to death, be he the king's son.

In the case of regular meals, this danger is easy to avoid, as the king has a house set aside for the purpose, where his food is laid on a table; he then enters and shuts the door; when he has finished he knocks and comes out.

But should the king when in state feel hungry or thirsty and call for food or drink, the cupbearer walks up to the throne, and turning his back to the monarch, rings a bell. The whole court instantly falls down face to the ground and there remains until the royal appetite is appeased.

The typical seats used in daily life by many of the tribes of Africa, and among some few of them at their curious rites, are depicted in our illustration. The stool is of wood inlaid with square pieces of brass; it is strongly made and supported by several cross-bars and an iron ring. In many tribes of Western Africa a stool similar to this one forms the king's throne, and is borne before him in state processions, the greatest attention and reverence being paid to it; on such occasions the seat of the stool is covered with red cloth.

King Kamehameha, of the Sandwich Isles, was the owner of the spittoon shown on the previous page. It is connected with some curious superstitions and customs of the natives. The bowl is made of wood, studded with human teeth—those, in fact, of the king's enemies slain in battle. The use to which he puts this curious bowl is symbolical of the scorn he felt for his enemies. To prevent any exorcism or incantation, a trusty attendant daily cleansed the spittoon in the sea; while the king had the constant satisfaction of reviling the memory of his foes, and of heaping insults upon them.

The Africans have many ingenious ways of making fire, and even have primitive bellows, which they use for household purposes and also for forging their numerous assegais and weapons. The specimen here reproduced is from Western Africa; the body is hollowed out of a solid block of wood, somewhat in the form of a rough pair of goggles, with two globular wind-reservoirs connected by an arched body, in which are set the two iron nozzles.

The globes are loosely covered across the top with skin, strongly secured by thongs in the same way as the thrifty housewife covers her jam-pots with parchment paper. In the centre of each skin cover is a staff, or handle, by means of which these ingenious but primitive bellows are worked.

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MATED BY A PAWN

THE ADVENTURE OF AN AMERICAN GIRL IN LONDON.

By A. E. Manning Foster.

When a man is about to entertain a very charming girl whom he is anxious to impress, and suddenly finds that, with the exception of a few odd coins, he has no money in his pocket, he may surely be forgiven the use of a few strong ejaculations.

Such was the plight of Everard Hamlyn at ten minutes to one on a certain Saturday afternoon. He had been so absorbed in reading the brief of an important case which was to be heard in the courts on Monday that he had forgotten the emptiness of his pockets. At one o'clock Alice Valentine, an American girl with whom he had formed a deep friendship, was coming to see what a barrister's chambers in the Temple looked like, and also to be taken out to lunch.

The worst was that there was only ten minutes to rectify the mistake. He wrote out a check hurriedly, and then remembered that time would not permit him to go to the bank to cash it. His clerk was gone, and the Temple was wrapped in its usual Saturday afternoon peacefulness.

Without a hat he rushed over to Harcourt Buildings to see if his friend Anderson was in chambers. He could rely upon him for a couple of pounds. But the fates were against Hamlyn. Anderson was out, and the doors were locked.

Realizing that there was nothing for it but to go to the bank, he hurried along up the court into Fleet Street, meaning to hail a hansom. But as he arrived there the clock struck one, and he knew that he could not get to the bank and back under twenty minutes. Alice would never forgive him if he were not at his rooms to receive her.

Suddenly his eye was caught by the three brass balls hanging over a shop almost opposite. The site suggested a new idea to his mind, and he promptly acted upon it. In another moment he rushed across the road, and entering the shop handed his watch over the counter.

"How much?" said the clerk, eyeing the hatless and breathless Hamlyn somewhat suspiciously.

"Oh, I only want a fiver," replied Everard hurriedly.

"Have you got a card on you?" asked the clerk, thinking he was on the track of a swell mobsman.

Unversed in the ways of pawnbrokers, Hamlyn pulled out his case and handed him a card.

"All right, sir," said the clerk, seeing the name and address, and noticing it cor-

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HAMLYN PULLED OUT HIS CASE AND HANDED HIM A CARD.

responded with the initials on the watch. "I beg your pardon, sir," and he hastily filled up a ticket and counted out five pounds. "Have you a penny for the ticket, please?"

Hamlyn impatiently threw down a copper and fairly bolted out of the shop. The people in Fleet Street stared at him with amazement, and a gutter arab, with whom he had collided, shouted, "Who are yer shovin' of?" as he crossed the road.

Now it happened that Alice Valentine was just at that moment passing down Fleet Street on her way to the Temple. She had arrived somewhat earlier than she had intended, for she upheld the traditions of womanhood with regard to unpunctuality.

"It would never do," she said to herself, "to be quite punctual. He would think I was too impatient."

So, timing herself to arrive in the Temple about a quarter past one, she was strolling leisurely along when she caught sight of Hamlyn rushing wildly out of a pawnbroker's shop. For a moment the ludicrous side of the situation struck her very forcibly, and she laughed softly to herself. But gradually, as she realized the full significance of the action, her amusement gave place to pity.

"Poor boy," she murmured, "I had not the faintest idea he was hard up. And to think that I have let him spend such a lot of money in taking me about. I must get even with him somehow."

There was a very tender spot in her heart for the tall, clever young barrister who had shown so plainly his preference for her above all other women. Alice Valentine and her aunt, Miss Safford, were making a tour of Europe, and had met Hamlyn first of all at a hotel in Geneva. He had rendered them a number of civilities, and as he happened to be doing the same round of Switzerland as they, for a month he was their almost daily companion. With the frankness of American women they accepted his attentions graciously, and, finding him a pleasant attendant, enrolled him in their service without further ado.

At parting he had given them his card, and promised them a good time when they arrived in London, and during the fortnight they had already passed he had certainly redeemed his promise. Almost every day he arranged some festivity for them. He had introduced them to his friends, and there had been a constant round of theatre-going, dinners, and sight-seeing.

Miss Safford generally accompanied Alice wherever she went, and showed quite as much eagerness to "do" every place thoroughly as her niece. It was only on rare occasions, when the elder lady was obliged to admit that she was "too tired for anything," that Hamlyn had a chance of taking Miss Valentine out alone.

The constant companionship, however, had brought about the usual result. Hamlyn was not an inflammable man. He had reached the mature age of thirty—not unsought after—without having succumbed to feminine charms. But there was something about the fair American which fascinated him in spite of himself. Her evident delight in everything she saw and did,

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her frankness of speech and absence of coquetry, rendered her a delightful companion, and from the realization that the days he spent with her were among the pleasantest in his life gradually grew the knowledge that she was becoming indispensable to his happiness.

To-day, as she came into his room a perfect vision of freshness and loveliness in the gloomy atmosphere of the Temple, Hamlyn was conscious of a certain shyness and reserve in her manner that he had not noticed before.

"I don't believe I ought to come here by myself," she said when he had closed the door. "I wonder what Aunt Catherine would say to it."

"You are late," said Hamlyn. "I have been waiting impatiently for you."

"Am I really?" replied Alice. "What is the time, then?"

He pulled at his watch-chain mechanically, forgetful of his escapade, and disclosed the bare swivel. He colored slightly as he realized his mistake and felt her eyes upon him, but answered lightly:

"About twenty minutes past one, I fancy."

She was walking round the room, glancing at the ponderous-looking books and the papers tied with pink tape, getting, as she expressed it, the "atmosphere" of the place.

"It must be just lovely to work here," she said. "Everything seems so old and historic. I believe I should only have to sit here a few hours a day and I should become a lawyer by breathing the air."

"Which reminds me," said Hamlyn, "that I have been breathing air quite long enough and want lunch. Where shall we go?"

Alice Valentine hesitated.

"Look here," she said at last, "I want to say something to you. You have been taking me about such a lot, and I have done nothing for you. I feel real mean. I want you to let me stand you a lunch to-day."

He shook his head laughingly. "You forget," he said, "that you are my guest; but I want you to say where you would like to go."

He named a well-known restaurant in Piccadilly, where she knew the prices were ruinous.

"No," she said, "don't let us go there. Will you take me to one of those little Bohemian places you told me of, where you get a *table d'hôte* lunch for eighteenpence? I should love to go. It would be a new experience."

"You look far too smart," he replied, glancing at her admiringly; "but I tell you what I will do. We will split the difference and go to a kind of semi-fashionable place where you shall see all sorts and conditions of people and hear a band."

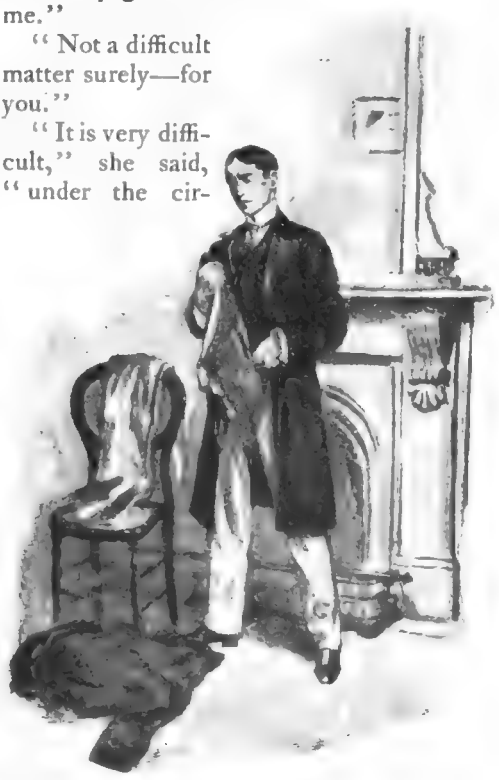
Once or twice during lunch, when conversation flagged, Hamlyn noticed again the thoughtful expression on her face. At last he took the matter up.

"Tell me," he said, "what you are thinking of?"

"I was thinking," she replied slowly, "of how I could help someone who has been very good to me."

"Not a difficult matter surely—for you."

"It is very difficult," she said, "under the cir-



HE FUMBLED IN HIS WAISTCOAT POCKET; IT WAS NOT THERE.

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cumstances. The person I want to help is poor and, I think, very proud."

She was looking down at the table-cloth and studiously avoiding his eyes.

"Can I be of any assistance?" he said.

"You—why—" she laughed. "Yes, perhaps you can. I will think about it and let you know."

There was a new sympathy in her voice and manner, and Hamlyn felt a mad desire to take her there and then in his arms and cover her face with kisses.

But there was no opportunity then to tell her of his love. Immediately after lunch they were obliged to hurry off to meet Miss Safford at a *matinée*, and Hamlyn had no further chance of a *tête-à-tête* with Alice; but he arranged satisfactorily a meeting for Monday afternoon, when he determined to put his fate to the test.

"THEY HAVE BEEN SO RUDE AND INSULTING," SHE SOBBED.

"You willnot forget," he said at parting, "to let me help you in the matter you mentioned?"

"No," she replied, with a singular look on her face, "I will not forget."

As Everard walked home he recalled her tones, her face, the fair, flushed cheeks, sweet mouth, earnest brows, and eyes of softest fire. There was that in her look which satisfied him.

He was awakened from his reverie by an urchin inquiring what o'clock it was. For the second time that day he mechanically tugged at his watch-chain.

"Confound it!" he exclaimed, as he realized his loss. "I never knew that it was such a nuisance to be without a watch. I must get it out first thing on Monday morning."

The urchin, grasping the situation, ran away grinning.

On Sunday Hamlyn again bethought himself of the watch.

"I had better study the ticket," he said, "and see what I shall have to pay."

He fumbled in his waistcoat pocket; it was not there. He tried the others with the same result. With growing uneasiness he searched in every pocket of the clothes he had worn on Saturday, but the pawn-ticket was not to be found.

"I must have left it at my chambers," he decided at last. "It is very careless of me. I hope my clerk won't find it."

On Monday morning he got up earlier than usual and drove down to the Temple in a hansom. His clerk had already arrived. Hamlyn searched all over the table carefully, then in all the drawers, but could not find the ticket. Finally he summoned the clerk.

"Have you moved any papers?" he asked rather irritably.

"No, sir, I haven't touched a thing."

"You haven't by any chance found a ticket, I suppose?" pursued Hamlyn.

"No, sir. What kind of ticket have you lost?"

"It doesn't matter," he returned impatiently; "it's of no importance."

Putting on his hat, Hamlyn hurried into Fleet Street to the pawnshop.

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"I want to redeem the watch I left here on Saturday," he announced.

"Where is your ticket, sir?" said the man.

"I have mislaid it," replied Hamlyn, "but it's all right. You remember me, I expect. The watch belongs to me, and I want it now."

"I am very sorry, sir, but you can't have it without the ticket."

Hamlyn muttered an exclamation of impatience.

"But suppose I have lost it, what then?"

"I will give you a form of declaration to be made before a magistrate."

"Is there no other way?" said Hamlyn, realizing the trouble and annoyance this would cause.

"No, sir," said the pawnbroker, "I am afraid there is not."

There was no time to waste. He had to be in court early, as his case was among the first in the lists. It was no use stopping to argue the matter. He must go before a magistrate and sign the declaration as soon as possible. Returning to his chambers, he put on his robes, and was soon lost in contemplation of the business in hand.

About an hour after his visit to the pawnbroker's shop, Alice Valentine drove up in a cab to the same door. She had found the pawn-ticket lying on Hamlyn's table on the Saturday afternoon, and had appropriated it, meaning to redeem the watch and send it back to him as soon as possible. She was rather nervous at going into the shop, but she was not the kind of girl to allow her own feelings to stand in the way of any project she wished to carry through, so, putting on an air of unusual haughtiness, she entered the little compartment and handed in the ticket.

"I want this watch, please," she said.

The pawnbroker's assistant looked her up and down carefully. He scented some horrible conspiracy. The smart gentleman was a "wrong 'un," after all, and this was evidently his accomplice. When he had, as it were, sized her up completely, he inquired dryly, "Where did you get this?"

Alice flared up indignantly. "That is no business of yours. Tell me what I have to pay, and give me the watch."

"Not so fast, please," said the young man impertinently; "you must answer one or two questions first."

He went away, and, after a whispered confabulation, returned with a gray-headed old man, whose hooked nose and sharp, ferretty eyes proclaimed him the pawnbroker-in-chief. He was polite, but firm.

"I am sorry, madam, but I cannot allow you to redeem this pledge until you inform me how this ticket came into your possession."

"I found it," said Alice, trying to preserve her haughty demeanor.

"Then you admit the watch is not yours?"

Alice nodded.

"Allow me to inform you, then," said the pawnbroker sternly, "that you are committing a very grave offence. If you found the ticket, you should have brought it here and informed us of the fact, or sent it to the person whose name is on it. By attempting to obtain the watch you lay yourself open to criminal proceedings."

"But—but—" said Alice desperately, "I am a friend of the gentleman to whom the watch belongs."

"Come, come," replied the man, "that won't do at all. A gentleman who called himself Mr. Hamlyn was here about an hour ago endeavoring to get the watch himself. He admitted he had mislaid the ticket."

"Mr. Hamlyn been here this morning!" cried Alice aghast. She had never suspected that he would be able to redeem his watch so soon. The bewilderment on her face was not lost on the pawnbroker.

"Better send for a policeman," suggested the assistant.

"Hold your tongue," said his master. Then, turning to Alice Valentine, he said, "I do not wish to be hard upon you, but I insist on an explanation. I will send over to the address on the ticket, and if your story is true, Mr. Hamlyn will

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HE TOOK OUT THE WATCH AND HELD IT BEFORE HER EYES.

corroborate it. Harvey, send the boy over to Queen's Bench Walk and ask Mr. Hamlyn to come here immediately."

"Mr. Hamlyn coming here?" cried Alice unguardedly. "Oh, I could never meet him here! I must go at once."

"I cannot allow it," said the pawnbroker. "You must wait. If you refuse, I have no option but to call a policeman."

If looks could kill, the pawnbroker would have died on the spot as Alice, with the air of a tragedy queen, submitted to the indignity of being escorted to the back parlor, while Harvey, a sickly smile on his face, kept watch and ward over her.

The boy who had gone over to Queen's Bench Walk was informed that Mr. Hamlyn was over at the Courts conducting a case in Appeal Court No. 1. Informed of the urgency of his presence at the shop in Fleet Street, the clerk condescended to take the message in person, and some quarter of an hour after Alice had been imprisoned, Everard Hamlyn jumped out of a hansom and hurried into the shop. He was an impetuous person, and he had not waited to change his robes, but had come straight away in wig and gown from the Law Courts. He was met in the passage by Harvey, who had been awaiting his arrival with keen interest.

"There's a woman in here," he said, pointing to the parlor, "who says she's a friend of yours, and has found your pawnticket; but I suspect——"

"Out of the way," cried Hamlyn, thrusting the officious young man on one side and rushing into the room.

"Alice, by all that's wonderful!" he exclaimed; and then seeing that her bosom was heaving convulsively, and that she was on the verge of tears, he put his arm around her and inquired tenderly what had happened.

"They have been so rude and insulting," she sobbed.

Hamlyn, whose temper was aroused, insisted on the most abject apologies from the crestfallen pawnbroker.

Then, when he felt he had done all that he could under the circumstances, he took Alice back to his rooms in the Temple. When they were alone, he said impulsively:

"Oh, my darling, I am so sorry, so frightfully sorry, that you should have had all this unpleasantness. How sweet of you to try to get my watch back for me, Alice. Did you do it because you care? Tell me, darling—I love you!"

She did not resist him when he drew her closer to him, but only hid her face on his shoulder while she said softly:

"It was very silly of me, I know; but I thought you were poor, and I wanted—oh, I wanted to help you."

"I am not poor," he said smilingly, "at least, not very poor. I have a thousand pounds a year of my own, and perhaps we might manage on that, if we are careful."

"It would not have mattered," she whispered, "if you had been the poorest man on earth. I love you, Everard. I think that I have loved you from the first moment I saw you."

He took out the watch and held it before her eyes.

"I shall never look at it," he said, "without thinking that I won you through it."

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TO READ IN THIS POSITION CAUSES THE MUSCLES OF THE EYE TO OPERATE IN A MANNER WHICH CONSTITUTES THE MOST COMPLEX COÖRDINATION OF WHICH ANY PORTION OF THE BODY IS CAPABLE.

HOW TO READ.

By Fred Baker, M.D.

Among the glories of modern medical science probably nothing ranks higher than preventive medicine, and in ophthalmology anything which will lessen the evil results of the almost universal abuse of the eyes, which the conditions of modern life and culture have crowded upon us, must take important rank. In this line, systematic instruction in proper methods of using the eyes given to patients, parents, teachers, and school-children, as often as opportunity offers, will yield valuable results. Instruction as to the care of the eyes is based on such simple principles that it can be made plain to any one, although it may have to be frequently repeated to make a lasting impression.

Three points are important in caring for eyes which are called upon to do much work at close range, whether it be reading, writing, sewing, or skilled labor in the arts or trades. First, sufficient light, either diffused, or falling upon the work in a proper direction; second, a proper position of the work, and, so far as it can be secured, a proper position of the body; third, avoidance of working to excess. A consideration of each point involves a consideration of the others, as they are interdependent.

The light should always be sufficient to give a perfect definition of every detail of the object or work under observation. If this condition exists the work can be held at a long distance from the eyes, and still be plainly seen, but if illumination be poor, the object must be brought close to the eyes in order to be seen distinctly, which, as we shall see later, is probably the most serious source of eye-tire. Furthermore, faulty illumination so greatly obscures good definition that increased work is thrown on the retina and the perceptive apparatus of the brain.

The position of the source of light is of much importance. Light should come

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from behind when possible, and be so arranged as to fall on the work without striking the eyes in a direct line, and we should avoid permitting any portion of the body or any apparatus used to throw a shadow on the work. For this reason, in writing or drawing, right-handed persons should allow the light to pass over the left shoulder, while left-handed persons should get their light over the right shoulder. This prevents the shadow of the hand from falling on the point of the pen or pencil where the most distinct illumination should be secured.

The most important consideration with regard to the position of work is the distance from the eyes at which it is held, and for the proper understanding of this every one should bear clearly in mind the very simple fact that eye-work is muscle-work, and that eye-tire is almost as absolutely a muscle-tire as is the fatigue of manual labor. This is plain and definite, while the problem of seeing might seem abstruse. The formation of the image of a distant object on the retina of a healthy eye, and its conduction to and perception by the brain, is no more tiresome and causes no more strain than the stimulation of the olfactory nerve by an odor and *its* perception by the brain. Either, if very long continued, may lead to temporary nerve exhaustion, but only enormous overstimulation leads to anything more than transient effects. So when we have eye-strain, we have primarily to consider how we have overworked the muscles of the eyes.

We need not consider methods of fitting glasses and adjusting the motor muscles of the eyes by exercise, prisms, or operation, except to say that all eyes which show strain when properly used should be fitted or adjusted, but we can lay down a set of rules for the proper use of the eyes, practically without exceptions, which, if universally followed would result in enormous benefit.

Two sets of muscles do the work of the eyes: the ciliary muscles within the eye-ball, which regulate the focus so as to produce a clear image on the retina, changing as the object seen is brought close to or removed from the eye; and the muscles attached to the outside of the eye-ball, which enable it to move in its socket. When any object is seen at a long distance, both sets of muscles are as nearly in a state of complete relaxation as is possible while the retina is receiving a clear image. As the object is brought closer to the eye the focusing muscles are forced to contract in order to preserve a distinct image, and as at the same time the eyes are gradually crossed, the muscles which turn the eyes inward are taxed. The strain upon both sets of muscles is greatest at the nearest point where it is possible to see an object distinctly, and it follows that the strain is lessened in even proportion to the increased distance from the eyes at which work is done. It is a fact that very few persons whose eyes are anywhere near normal are conscious of any eye-tire so long as they are not obliged to do continuous work on objects within two or three feet of their eyes, and this accounts almost entirely for the utter absence of eye-strain among savage races. The charac-

CORRECT POSITION FOR READING.

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ter of work or the fineness of print and the clearness of the light may limit the distance at which work can be done, but most eyes will find the conditions easiest, when the work is continuous, if the object can be distinctly seen when held at a distance exceeding eighteen inches. The object should not be carried so far away as to render it at all indistinct, but, with normal vision and good clear print, reading at twenty or twenty-four inches will generally be found easy and pleasant. For other kinds of work the length of the arms often renders this longer distance impracticable, especially with children, but as reading is the one form of eye-work which is oftenest carried on for long periods without intermission, it is in this work that most care should be exercised, and in order to secure a proper position of the book the use of reading-racks or reading-desks should be much more common than it is. Conditions within the eyes themselves may make long reading and working distances not easy for the eyes, but such cases are abnormal and would generally be greatly benefited by the attention of a competent oculist.

INCORRECT POSITION—THE HEAD FORWARD, THE BOOK TOO CLOSE.

The usual directions for a reading position are: Sit erect, or, better, with the head thrown slightly back of the perpendicular; hold the book well up, have the light falling from behind, or slightly above, and preferably over the left shoulder. To these should be added very specific instructions on several points, the most important of which, as we have seen, is that all work should be held at the greatest distance at which it can be seen distinctly, and, if vision is normal, would better average over eighteen inches than under.

An unfortunate idea is quite prevalent that the reading distance should be fourteen inches, which is often much too close. The distance at which work can be carried on is only limited by the illumination and the size of the object in detail.

A minor but really important cause for eye-tire in reading is holding the book at an improper angle. The line of letters should always be held at right angles to a line extending from the eyes to the print. It is comparatively easy for the eyes to act if the ciliary muscles are set at a definite focus and the rotating muscles are alone called upon to move the eyes from side to side of the page, but if the two sides of the page are at different distances from the eyes, the motion of rotating the eyes from side to side of the page, in absolute unison to prevent doubling of the images (diplopia), associated with a change of focus for each fraction of the line of letters as it is passed, then jumping back to the beginning of the next line and refocusing, constitutes possibly the most complex coördination of which any portion of the body is capable. We should conclude *a priori* that this process must be extremely fatiguing, and any one starting when the eyes are slightly tired can demonstrate the fact in a few moments.

For a considerable time I have been growing certain that oculists are very generally making a mistake. I judge from past personal views and practice, from what patients have invariably reported, and from published writings. I refer to the question of reading in bed or in a recumbent posture. I do not recall a word of advice on the subject, either oral

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or written, which has not been a sweeping condemnation of the practice. Yet we all know that patients read a great deal in a recumbent posture, and we can all recall cases of invalids who have been in the habit of reading in bed very continuously during a series of years, who report that their eyes are the best part of them—often that they never cause the slightest trouble.

Following up the case of those who will read in a recumbent position in spite of all contrary advice, it occurred to me that I should at least direct them how to use the eyes in a manner which would cause the least possible damage—if they would persist in a pernicious practice. This led to a study of the subject, and I was surprised to find not only that there is no valid reason to be urged against using the eyes in a proper manner in a recumbent position, but that such use is the least tiresome, and can be persisted in for longer periods without damage than any other position. We all know that grave damage is often done by reading in a recumbent posture, but I fear oculists are largely at fault. Had it been the universal practice during the past twenty or thirty years to give careful directions how to read lying down instead of saying to one and all, "You must not read lying down," there would be less near-sight and better eyes in the community than now exist. Three easily avoided errors cause all the damage possible from reading lying down, the first often leading to the other two. They are insufficient or wrongly directed light, short reading distance, and tipping the book out of a plane at right angles to the line of vision.

It is common for people to lie down to read at a distance from a good light, and often the light is not only poor, but in such a direction that it is impossible to hold the book properly and illuminate it at all. Sometimes the light is in front, which always throws the print in shadow, necessitating a close reading distance, which is likely to produce cramping of the ciliary muscles, congestion of all the internal structures, and permanent progressive near-sight. Or, in order to secure even fair light, it is necessary to tip the book so that both the ciliary and extrinsic muscles are overworked and eye-tire soon supervenes.

If, however, every one reading lying down will so arrange his lounge or bed that the light comes over the head without striking the eyes, and falls well upon the page; if he will hold his book at a long reading distance, and take care that the line of letters shall be at right angles to the line of vision, all of which may re-

INCORRECT POSITION FOR READING WHEN LYING DOWN. LIGHT WRONGLY DIRECTED, PAPER TIPPED AND HELD TOO CLOSE TO THE EYES.

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CORRECT POSITION FOR READING WHEN LYING DOWN.

quire a book-rest, he can be sure to do his eyes no more harm than if he were sitting up. More than this, there is a large credit in favor of reading lying down. The recumbent posture allows more rest of all the bodily structures than the sitting posture, and there is greater possibility of resting and repair in that position. Those who have tried it know the benefits accruing, after a hard day's work, from the rest possible when doing a long night of reading, which the press of business makes almost an absolute necessity, and I have met busy practitioners of medicine who felt the need of this rest, but were afraid to take it because of a superstition that they might ruin their eyes.

One more fact is to the credit side of the score. Whenever possible we bring gravity into play to relieve congestion, especially that of a passive type. It has long been recognized that throwing the head slightly back beyond the perpendicular brought gravity into play to empty the choroidal veins and those of the uveal tract, which are principally overfilled by prolonged eye-work, but why we have failed to carry this to its logical conclusion is a mystery. It is so plain that carrying the head back to a horizontal position so absolutely meets the whole problem of a relief of a congestion by gravity, and it is a very important problem, that it seems strange that we have not been advising all our patients with weak eyes and internal congestions to practise, so far as possible, reading in a dorsal, recumbent position, with the head raised only so much as is necessary to make the position perfectly comfortable. I feel sure that such advice carried out with absolute care as to light and the position of the book would in the case of a thousand busy people add largely to the number of hours which reading could be indulged in without detriment to the eyes or general health.

Eyes should not be used when they are tired or there is evidence of eye-strain. But if vision is up to the recognized average, when the eyes do their work without tire or eye-strain, long continued use with the precautions above noted rarely does harm. Certain symptoms besides simple tiring indicate eye-strain, and when they supervene should be accepted as a warning to stop work for a longer or shorter rest as experience may show to be necessary. Sometimes a few minutes may suffice, at others hours or days may be required. These symptoms are headaches, especially if located in the forehead, temples, or back of the head, blurring of vision or dancing of letters, burning or scratching of the lids, and in rare instances jerking of the muscles of the face constituting a phase of St. Vitus' dance. A large proportion of the cases showing any or all of these symptoms can be easily and perfectly relieved by an oculist's attention. It should be remembered that the use of the eyes cannot be persisted in when these symptoms are present without grave risk.

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"OF COURSE YOU ARE ENGAGED?"

A MAN OF SCIENCE.

A COMEDY IN ONE ACT.

By George Henry Payne.

Cast of Characters.

Allen, the Man.	Mrs. Farrington, the Sister.
Newcomb, his Friend.	Miss Languish, the Girl.

TIME—The Present.

SCENE—*Drawing-room of* Mrs. Farrington's *cottage in the mountains. Furniture light in tone and pattern. Piano, centre. Small table well down* R. *Glass doors opening on porch, oblique, 3* R. *Doors, 2,* L. C. *left of piano and 1* R.

DISCOVERED—Newcomb *in light summer attire, very foppish-looking, at the piano, playing.* Allen *near table, in travelling suit (very practical-looking), is impatiently breaking matches in an attempt to light a cigarette.*

Allen. I wish you would stop that confounded playing and listen to my tale of woe.

Newcomb. Tales of woe, dear boy, are signs of a lower species. We have evolved out of that stage. (*Still plays.*)

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ALLEN. Evidently you have evolved into a more lamentable one.

NEWCOMB (*stops playing and turns around*). Well, tell me. I am always glad to hear your woes.

ALLEN. Yes, confound you, I think you enjoy hearing my woes more than my rejoicings.

NEWCOMB. You never have any of the latter—you're like an actor, always kicking.

ALLEN (*impatiently*). Listen to me——

NEWCOMB (*dropping aggressive manner*). Go on, Al.

ALLEN. Well, I am—well, I am at last really in love.

NEWCOMB. With any particular person ?

ALLEN. Unfortunately with a too particular person.

NEWCOMB. Of course you are engaged ?

ALLEN. To be very miserable—which, in this particular instance, means that I am not to marry the adored one who is my illumination and the rest of it. Confound it. (*Crosses* R.)

NEWCOMB. Isn't this rather unusual in your love affairs ?

ALLEN. In my—I have never had a love affair until now. Most of my love affairs, so called, have been instituted for the express benefit of the party of the second part.

NEWCOMB. And your engagements ?

ALLEN. The results of a philanthropic disposition. Many of my engagements came about through the kindly intervention of my mother, who believes that some woman is responsible for every man. And the dear lady has been trying to shift the responsibility ever since I became of age.

NEWCOMB. Well, you don't blame her, do you ?

ALLEN. Look here, Conny, I am in deadly earnest.

NEWCOMB. You usually are deadly when you are in earnest.

ALLEN. I once said the same thing about you.

NEWCOMB. Yes, I know it. It is your saying, and I give it back to you.

ALLEN. A little the worse for wear, if you have used it as freely as you used most of my things at school.

NEWCOMB. But the girl!

ALLEN. Well, she is a girl with intelligence, brains——

NEWCOMB (*interrupting*). And you have the temerity to hope she will marry you ?

ALLEN (*apparently not heeding the interruption*). She is used to the society of great men. She prefers them. They are great, and I am nobody.

NEWCOMB. You are young.

ALLEN. Unfortunately, the sole distinguishing quality of mine that you name she refuses to regard as a recommendation; in fact, she rather suggested that it would be a good thing to get rid of.

NEWCOMB. You have possibilities.

ALLEN. But she won't speculate.

NEWCOMB. Has conscientious scruples against it, eh ?

ALLEN. Yes, both against it and against me.

NEWCOMB. Oh, then she has specific objections to you, has she ?

ALLEN. Hardly specific. She simply says she doesn't like young men.

NEWCOMB. Well, you'll be an old man some day.

ALLEN. Yes, and she says that is about all I ever will be.

NEWCOMB. Well, I don't think you are to be condoled with so much as congratulated. You have evidently met some one who has fathomed you correctly. My boy, even if you don't marry her, she'll do you good. Her influence will act like a tonic.

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ALLEN. But I don't care to have somebody else run off with my tonic just when I want it myself.

NEWCOMB. Well, my advice would be——

ALLEN. I don't want your advice, I want your help.

NEWCOMB. My help! Oh! Perhaps you want me to make love to her for you.

ALLEN. You make love to her! Pooh! Why, she wouldn't look at you.

NEWCOMB. Eh! Why not? You say she doesn't like young men. Well, I am of the right age. "Fond of men of brains"—that about describes me. "Likes the company of men of genius"—that also fits me, and, in addition to that, I throw in my good looks, my worldly experience, my wit, my wealth——

ALLEN. And your modesty, I presume.

NEWCOMB. True—one of my biggest charms—I had almost forgotten that. Then there's my generosity.

ALLEN. Your generosity, like your piano playing, is all technique and no feeling.

NEWCOMB. Still, I think I could win her from you.

ALLEN. You don't know that the lady is coming here?

NEWCOMB. This house! When—how? What do you mean?

ALLEN. She's coming to this house, to-day, to visit your sister.

NEWCOMB. Then all this worriment, all this excitement, all this taking up of my valuable time, has been caused by poor little Miss Languish.

ALLEN. "Poor little Miss Languish." Evidently you don't know her. "Poor little Miss Languish." I'd like to hear you say that before her.

NEWCOMB. Why, she is only a child.

ALLEN. A child in years, but her mind—well, she downed a Presbyterian minister in a discussion about the eighty-nine articles.

NEWCOMB (*correcting with the positive air of a man who knows it all*). Fifty-nine.

ALLEN (*hesitating and then impressed by* NEWCOMB's *pompous air into believing that he is right*). Well, fifty-nine articles, and she talked science with Professor somebody or another in a way that would make your hair curl. She reads everything and everybody, and when she gives you one of her piercing glances you feel that your entire past life is revealed to her.

NEWCOMB. Under those circumstances I should feel excessively proud. But tell me, how did you meet her?

ALLEN. I met her in Boston in the spring. I didn't say anything to you about it at the time, because it was just developing. Then I met her in July at Rock Beach. There it developed.

NEWCOMB. What developed?

ALLEN. Our love affair.

NEWCOMB. "Our" love affair?

ALLEN. That is, my love affair. I found out that she knew your sister very well, but it was only the other day that she hinted that she was coming here. I didn't say anything to intimate that I was coming here, too, but bade her farewell forever, swore that I would go to Africa and never return, and came here.

NEWCOMB. Let me see. Your love sprouted in spring and blossomed in July—just like a cabbage plant, wasn't it?

ALLEN. Please don't joke. I am serious.

NEWCOMB. You look the part. How am I to help you?

ALLEN. Well, she has heard a great deal about you. Some fool or another told her that you were clever. (NEWCOMB *looks pleased*). She has an idea you are a man of science; that you know the antediluvian ages like a book——

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NEWCOMB. So I do.

ALLEN. Yes, like a blank book. She believes that you are on speaking terms with the Ichythyosaurus and all his family; that there isn't a bug or beetle in the universe that you haven't spent a week with.

NEWCOMB (*looking very disconsolate*). Great Scott! And I don't know the difference between a flying fish and flying trapeze.

ALLEN. She believes you have written several books on sociology, psychology, eudæmonology, and so forth. And (*nonchalantly*) of course I told her this wasn't the beginning of what you knew.

NEWCOMB (*angered*). You've got me into a nice pickle. What the deuce did you want to do that for?

ALLEN. Because I wanted you to help me. She comes here believing that you are one of the most interesting and remarkable men that she will ever meet. (NEWCOMB *forgets the "burden of his knowledge" and smiles in a self-contented fashion.*) Now if you can make her believe you are (NEWCOMB *looks crest-fallen again*), and if you, as a friend of mine, will tell her what a fine fellow I am, what a brilliant future I have before me, and that I know more than even you, but am too modest to talk about it, why I am sure that her respect for you is so great that I will begin to have some show.

NEWCOMB (*condescendingly pleased that a pretty girl should prefer his opinion to that of his friend*). Of course, old man, I'll say lots of nice things about you. (*Aside, gleefully.*) Won't she and I have a jolly time together!

ALLEN. But you can't meet her in that costume.

NEWCOMB (*looking proudly at his clothes*). Why not? What's the matter with these?

ALLEN. Matter, why everything's the matter with them. If there's anything she hates its a well-dressed man. She says it shows lack of brains. And that necktie. You don't suppose that a man with a red and white necktie could ever write a book on sociology.

NEWCOMB (*ruefully*). No, I don't suppose so.

ALLEN. And cut your mustache in several places, so as to make it look as though you didn't care about your personal appearance.

NEWCOMB (*aroused and indignant*). Oh, I say, this is too much——

ALLEN. But think what it all means—happiness for life for me and the friendship of a pretty girl for you.

NEWCOMB (*his aggressiveness subdued by the latter suggestion*). Yes, that's something.

ALLEN. And tousle your hair all up. By Jove! (*Goes up to glass doors, 3* R. *and looks out*). Your sister and Miss Languish are coming now. I forgot she was due on that three-twenty.

NEWCOMB (*excitedly*). What will I do?

ALLEN (*rushing him off* L.). Get on the oldest and poorest clothes you've got, make up as though you were a man of science, and then go out and dig in the garden.

NEWCOMB (*worried*). What will I dig for?

ALLEN. Worms, birds, any old thing.

NEWCOMB. But what will I say when she talks science to me?

ALLEN. She'll do all the talking. When you need to talk I'll prompt you.

NEWCOMB (*protesting against being pushed off, and much in doubt about the prospect*). Say, this is a pretty tough business.

ALLEN. But you'll make a success of it. Now don't say anything funny, or try to be bright, because she hates clever people and——

(*The noise of a carriage and approaching voices is heard outside 3* R.)

NEWCOMB (*anxiously endeavoring to cross* R.). Just let me get a glimpse of her.

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ALLEN. Not in that rig. You'd be lost. (*Pushes* NEWCOMB *off 2* L.)

(*Voices are heard on the porch approaching 3* R. ALLEN *comes to* R., *looks out on porch quickly.*)

ALLEN. Now, by Jove, I'm in for it!

(*Exit 1* R.)

(*Enter* MRS. FARRINGTON, *about thirty, and* MISS LANGUISH, *about nineteen, the latter very much the sentimental school-girl in appearance and manners.*)

MRS. F. (*crosses* L.). I suppose, dear, you want to go to your room at once. You must be tired after your ride. (*Sits.*)

MISS L. (R.). Not at all. (*Throws hat on chair and leans back on couch.*) The ride wasn't a bit tiresome.

MRS. F. You know the scenery so well that I thought——

MISS L. Oh the scenery never bothered me. There was a man in the chair opposite, and he had the loveliest eyes——

MRS. F. Lucille! I hope you didn't——

MISS L. No, of course, I didn't. But when it gives you a headache to read, and you know the scenery like your prayers, it isn't any harm to look at a man's eyes, is it?

MRS. F. Sometimes it is, Lucille.

MISS L. (*convincingly*). But these were the kind of eyes to admire.

MRS. F. I'm always afraid, my dear, that you'll do something indiscreet.

MISS L. (*woefully*). I never get the chance.

MRS. F. Lucille!

MISS L. I know that sounds horrid, but you can't imagine what a dull summer I've had, with nothing but old scientific fossils about me all the time. There was only one nice chap at Rock Beach, and he made love like the Fast Flying Vestibule.

MRS. F. What do you mean?

MISS L. (*laughing*). Why, there were no stops.

MRS. F. (*pretending to be shocked, really much amused*). Does your aunt know you use this slang?

MISS L. Does she? Every ten minutes (*imitating*), "Lucille, your father shall be told of this."

MRS. F. Is he told?

MISS L. Oh, yes!

MRS. F. What does he do?

MISS L. Chuckles me under the chin and says, "Little goose, don't get slangy."

MRS. F. And you?

MISS L. Why, I chuckle him under the chin and say, "Big bear, don't get gay."

MRS. F. (*laughing in spite of her severe attitude*). What does he do then?

MISS L. Gives me the check for my next month's allowance.

MRS. F. You are positively shocking, Lucille.

MISS L. Yes—isn't it delicious?

MRS. F. I wonder what our clever visitor will think of you.

MISS L. Is he really clever? I do love clever people.

MRS. F. Weren't there any at Rock Beach?

MISS L. Oh, no. They just knew everything. Clever people don't know anything—they pretend they do, and they keep you guessing. I wish I were clever.

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MRS. F. (*laughingly*). You are, in a way, Lucille.

MISS L. Oh, I mean really clever—like a charade, or an impressionist picture, or a play by Ibsen. You know I'm writing a play ?

MRS. F. The same play you were writing a year ago.

MISS L. Well, it is not quite the same—I've changed it a little.

MRS. F. How far have you got ?

MISS L. Well, I haven't begun on the sub-title yet. I'm collecting the bright things that men say to put into the mouths of the leading male characters.

MRS. F. How about the bright things women say ?

MISS L. They don't say any.

MRS. F. How unkind. Your own sayings, for instance.

MISS L. (*laughing*). They all belong to bright men.

MRS. F. Is that the Rock Beach style of modesty ? But here comes our clever visitor.

(*Enter* ALLEN *1* R.)

MRS. F. Mr. Allen, allow me to introduce——

MISS L. Why, it's Albert. So we do meet again, do we ? Agnes told me that somebody clever was here. I never expected that description would apply to you.

ALLEN. No—er—I suppose you didn't.

MRS. F. Then you know Mr. Allen.

MISS L. Oh dear, yes; we're engaged.

MRS. F. Engaged!

MISS L. Yes, on a platonic system.

MRS. F. What do you mean ?

MISS L. Well, in six months if I do not fall in love with some one, I shall try to fall in love with Albert. And in case I fail in the first instance and succeed in the second, Albert has permission to ask me to marry him.

MRS. F. What an idea ! That's quite novel.

MISS L. Isn't it ? It took us some time to evolve it, and it was only after several joint conferences with ourselves and each other that we adopted it as amended.

MRS. F. As amended ?

MISS L. Yes. If Albert does something really clever, the platonic engagement is to be *cut* down to three months. And if he is particularly stupid it is to be lengthened to nine months.

MRS. F. Well, well. Why don't you say something, Mr. Allen ?

ALLEN. Can't. I'm afraid of those three extra months.

MISS L. (*crosses* L.). Yes, he's very stupid. (*Aside to* MRS. F.) He's the dearest chap in the world. (*Aloud.*) Yes, he's not only stupid, but he's absolutely without experience, and gives all his time up to his stupid business. I don't like a man who's not romantic. Now you know, Albert, you've never been married, or divorced, or buried alive, or eloped with, or anything at all. Now you, Agnes—how charming it must be to have a brother who was once the star in a great scandal.

MRS. F. Lucille, you mustn't speak so of that unfortunate affair. Conny is a changed man.

ALLEN (*sotto voce*). Changed man! Well, when she sees him in a few moments he'll surprise his own sister.

MISS L. Well, nevertheless, it's very nice. I only wish Albert would run away with some one or do something exciting.

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MRS. F. How about his running away with you?

MISS L. And have somebody have the advantage of the scandal afterward? No, thank you.

(NEWCOMB *walks into the room aimlessly, with his head resting on his hand, as though in deep thought. Hair disheveled, mustache clipped unevenly, no necktie or collar, shirt open at the front, à la Walt Whitman, old torn coat, trousers bagging at the knee, old boots, one end of one trouser caught in the shoe, etc., etc.*)

MRS. F. (*astonished, crosses* R.). Why, Conny!

ALLEN (*whispers to her*). Don't give him away. It's a little joke. Pretend that he's eccentric.

MRS. F. There's no pretension about it. Dear, let me introduce you to my brother. (*Aside to* NEWCOMB.) What does all this mean?

NEWCOMB. Sh! (*aside*). (*Aloud.*) Mr. Allen was telling me that you are interested in science and religion.

"TALK ABOUT THE ICHTHYOSAURUS."

MISS L. (*with suppressed anger*). Oh, yes. I just dote on 'em both. One of my pet fads is the collecting of the relations between sociology and psy-psychology.

NEWCOMB. Yes—they—are—er very interesting. I—er—believe— (*What the devil can I say?*)

ALLEN (*crosses in back of him*). Talk about the Ichthyosaurus. (*Aside.*)

NEWCOMB (*brightening*). A specialty of mine is the Ichthy-Ichthyosaurus.

MISS L. (*getting mad*). Oh! So *you're* interested in the Ichthyosaurus, too, are you?

NEWCOMB (*self-satisfied*). Oh, yes—very much, very much. Do you know much about the——

MISS L. (*sarcastically*). Do I? Well, I should say I do. I suppose you're up on Mastodons, too, aren't you?

NEWCOMB (*a little puzzled but still believing he is making good progress*). Oh, yes, very much so.

MISS L. I thought so. They go together. I've had Mastodons and the Ichthyosaurus for breakfast, luncheon, and dinner for the past two months.

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They were a little hard to digest at first, but I got used to them. But I must beg to be excused from discussing them now. (*Looks at him disgustedly and walks up* C., *where she is joined by* MRS. F.)

ALLEN (*rushes up to* NEWCOMB. *Shakes hands with him*). You're doing splendidly, old man—you're simply great.

NEWCOMB. But see here, she doesn't seem to want to talk science.

ALLEN. Don't you believe it. The trouble is she disagreed with several of the professors about the origin of the Ichthyosaurus, and she thinks you're on their side. Wait a little until you know her.

NEWCOMB. But she doesn't look a bit like a serious woman.

ALLEN. But she is, she is; don't let her looks deceive you. And she likes your appearance, I can see from the way she looked at you.

NEWCOMB (*pleased*). Think so. It's a great make-up, isn't it? She's deuced pretty, isn't she? Don't blame you for being in love with her. I'm almost that way myself now.

ALLEN (*aside*). I knew you would be, confound you! That's why I took a few precautions.

NEWCOMB. Now see here.

(*The two converse.*)

MISS L. (*up stage to* MRS. F.). Everybody at Rock Beach said your brother was good-looking.

MRS. F. (*looking at him in wonder*). So he was, Lucille, up to a short time ago.

MISS L. Well, what happened to him there?

MRS. F. (*viewing his baggy trousers*). I'm sure I don't know. You will pardon me, dear. I'll go and see if your room is ready.

(*Exit 2* R.)

ALLEN (*aloud*). I say, old man, I saw some specimens of that rare Myriophyllum verticulatum in the pond to-day, and I think you had better hurry up if you expect to get them. Somebody else will be after them.

NEWCOMB. The mirrer—what— Oh, yes, yes (*aside*). Is it a plant or a fish?

ALLEN. A plant, you fool.

NEWCOMB (*smiling sweetly*). Wouldn't you like to accompany me, Miss Languish, to see these wonderful mirrer—er—er—these wonderful plants?

MISS L. I should be delighted, but I have a slight headache—some other time.

NEWCOMB. Then you'll come, Mr. Allen?

ALLEN. Not just yet. (*Aside.*) I want to stay and dilate on your merits. You see, she is so much amazed at meeting a real man of science, that I had better tell her more about you.

NEWCOMB. Do tell her a lot about me. (*Sotto voce.*) Poor Albert, if I can't make any impression, what a poor chance he stands. (*Exit.*)

MISS L. Well, if this isn't the most marvellous summer I ever passed. First a man who writes books on the dear-Lord-knows-how-many articles, then a man who collects the relations between sociology, and now nipping all my hopes of a summer flirtation in the bud—a man who dotes on mirrer something or another, and to think, Albert, that anybody ever eloped with that. How did the woman ever do it?

ALLEN. Love is blind.

MISS L. In that case it must have been very nighly educated.

ALLEN. I always had my suspicions that she ran away with him out of charity for his friends.

MISS L. Well, how did it—he—ever find its way back?

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ALLEN. I believe the feminine member of the eloping couple thoughtfully purchased one return ticket.

MISS L. What a pity she didn't use it.

ALLEN. And so you don't like him?

MISS L. Like him? How can you? I would as soon think of falling in love with my old school edition of Gray's Botany.

ALLEN (*sotto voce*). Bravo!

MISS L. And you, Albert, you told me he had charming manners, that he had been led into that unfortunate affair out of pure chivalry, that he was bright, clever, polished——

"IT WAS CLEVER. NOW WASN'T IT?"

ALLEN (*aside*). That was before I knew you were coming here.

MISS L. I really believe that you did it out of pure fear that I might fall in love with him.

ALLEN (*dubiously*). Yes.

MISS L. Now that was clever of you——

ALLEN. Clever. Ah, then you admit that I have done something clever?

MISS L. (*sees that she has made a dangerous admission*). Oh, ah, but I didn't mean very clever—just a little clever, you know.

ALLEN. But still (*taking her hand*) it was clever. Now, wasn't it?

MISS L. Well (*giving in*), if I said so, then I suppose I said so.

ALLEN. So that the period of platonic engagement is cut down three months?

MISS L. Yes, I suppose so——

(*Noise outside, laughter and angry ejaculations. Enter* MRS. F. *and* NEWCOMB 2 R.)

MRS. F. (*laughing*). Why, Mr. Allen, what a rogue you are.

NEWCOMB (*crosses* R., *angrily*). He's more than a rogue. He's made a fool out of me.

ALLEN (*laughing*). That was easy enough.

NEWCOMB. My dear Miss Languish, I'm not a man of science at all. I don't know a beastly thing about Mastodons and—— It was Allen who filled me up with that stuff.

MRS. F. Wasn't it clever of him?

MISS L. Yes, it was.

ALLEN (*delighted*). Then I may ask you to marry me.

MISS L. Yes, if——

NEWCOMB (*interrupting*). Don't marry him, Miss Languish. He's a fraud.

MISS L. (*giving* ALLEN *her hand*). I like frauds.

MRS. F.—NEWCOMB. MISS L.—ALLEN.

CURTAIN.

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AFTER THE ACCIDENT

By Jeffery Denison.

It is astonishing what a fascination appears to surround the scene of a terrible disaster. Whether it be railway collision, landslide, flood, or cyclone, there are always hundreds of people ready to travel long distances and put themselves to almost any inconvenience so that they may be able to tell their friends they have witnessed the scene of the catastrophe. This is particularly noticeable in the case of a big fire. For days after a disaster of this kind has occurred, the desolate and blackened scene is visited by thousands of people of all classes, conditions, and ages, and the sale of photographs showing the damage wrought by the disaster is astonishingly large in provincial towns and rural districts.

So interesting, indeed, is the subject, that we have collected a large number of photographs from different parts of the world showing the after effects of some terrible catastrophe. It is a long time since a disaster has occurred of such magnitude as the great fire in the business portion of London of three years ago. Whole streets were destroyed in an alarmingly short space of time, and but for the fact that the fire broke out during the luncheon hour, the district of Jewin Street would have become a veritable death trap to hundreds of men and women who found employment in the doomed warehouses and offices.

Photo by London Stereoscopic Co.

AFTER THE GREAT JEWIN STREET FIRE.

A magnificent pile of warehouses stood where the bricks are heaped.

The magnitude of the disaster can be easily realized by a glance at the photographs which we publish. The first one shows the general effect after the fire.

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Photo by London Stereoscopic Co.

THE INTERIOR OF THE METROPOLITAN TABERNACLE AFTER THE FIRE.

Spurgeon preached there for thirty years or more.

April, 1898. This Mecca of the Baptists had been the scene for thirty years or more of the labors of the most original and powerful preacher of the century. Its destruction was indeed a calamity, for the Metropolitan Tabernacle had come to be looked upon almost as a national building. Our photograph, taken the day after the fire, shows how completely the interior of the famous building was destroyed. Scarce a vestige remained save the outer walls.

One of the most remarkable photographs taken after a fire is that which we publish, showing the effects of the severe frost of the winter of 1890–91, upon the buildings destroyed in the great Queen Victoria Street fire in London. On the night of the outbreak the

Photo by London Stereoscopic Co.

This illustrates the remarkable escape of old Cripplegate Church.

What was before a pile of magnificent warehouses and workshops, forming a perfect hive of industry, is now a desolate scene of ruin and destruction. The other photograph is, perhaps, the more interesting, as it shows the almost miraculous escape of Old Cripplegate Church. This historic structure remained practically undamaged, although the huge buildings all around were completely razed to the ground. The photograph shows the condition of the churchyard immediately after the fire.

Another London fire of less magnitude, but of far greater interest, was that of the Metropolitan Tabernacle in

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thermometer was many degrees below zero, and despite the terrific heat from the flames, the water from the hose froze on the walls and lamp-posts in the immediate neighborhood of the burning building; and as soon as the firemen began to gain control, the water froze on the crumbling walls themselves.

Our photograph shows the extraordinary effect of the frost on the interior of the gutted premises. The rafters and poles, which are here covered with icicles, were only a few hours earlier red hot.

Photo by London Stereoscopic Co.

One of the most remarkable photographs ever taken after a fire. It shows the premises in Queen Victoria Street, London, destroyed in the great fire of 1890. The frost was very severe and the water froze as it fell on the burning rafters.

Our photograph of Port-au-Prince, the capital of Hayti, gives an idea of a ruined city of the ancients. The whole of the foreground, which shows the western portion of the city, is in ruins. This state of affairs was brought about by a terrible fire which raged in December, 1897, destroying eight hundred houses, a church, a number of large shops, and rendering five thousand unfortunate people homeless. Port-au-Prince seems to be at the mercy of incendiaries, and it is supposed that the fire referred to above, like many scores of smaller fires, was started by some malicious person or political malcontent. The flames raged with terrific vehemence, and had it not been for the fact that the wind changed while the fire was in progress, probably the whole city would have been reduced to a heap of cinders. There is no efficient fire brigade in Port-au-Prince, and the people were quite powerless to stop the flames.

More damage is done by cyclones and tornadoes than by all other forms of catastrophe combined. Look, for instance, at our photograph of the main street of St. Louis after the great cyclone of six years ago. Business was proceeding as usual on the fatal morning, and there was little extraordinary to be noticed in the conditions of the atmosphere. But suddenly, and without previous warning of any kind, a cyclone struck the chief city of Missouri and wrecked the greater part of it. Trains were derailed by the hurricane, trolley-cars were lifted from the tracks and dashed against houses, and people were taken from their feet and thrown a hundred yards away. Scarcely a building remained undamaged. The large hotels of eight or nine storeys collapsed as though they were constructed of matchwood, and hundreds of people were killed by falling buildings. Business was almost entirely suspended for a week after the catastrophe; and, indeed, there were scarcely any buildings in the trail of the cyclone at all fit for business occupation. The main street of the great city was little more than a mass of ruins, and in many cases vast buildings were completely razed to the ground.

A cyclone, as its name implies, is a terrible wind which travels at great speed

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From a Photo.

PORT-AU-PRINCE, HAYTI.

In December, 1897, a terrific fire threatened at one time to devastate almost the entire town. Fortunately the wind changed in the nick of time.

along a spiral course, while a tornado is simply a terrific hurricane; but as far as the effects go there is little to choose between them. The tornado that swept over Louisville in 1893 was a remarkable and fearful example of the destruction a strong wind can effect. In this case all the buildings in the line of the hurricane were completely wrecked. The great Union Depot was reduced to a mass of splinters, as will be seen by our photograph.

Another building which was destroyed was the Church of the Sacred Heart. But here a remarkable thing occurred. Although the walls were thrown down, the roof carried away, the floor torn up, and the pillars twisted and broken, the beautiful statue of the Virgin, which stood upon the high altar, remained in its position, and was absolutely uninjured. This fact was looked upon by devout Catholics as an undoubted miracle, and the image, which now stands in a new and more pretentious church, is the object of greater reverence than ever.

We give one other photograph taken after the Louisville tornado. It shows a wild swan that had been caught by the wind and hurled to the ground, where it lay dead amid the *débris* of trees and houses. This incident is remarkable from the fact that wild birds are said to have an intuitive knowledge of the approach of a tornado or cyclone, and usually make their escape before its arrival.

We are able to give a unique photograph taken at Grinnell, Iowa, after the great tornado of June 17, 1882. It shows the complete wreck of a house, the whole of the interior being laid open to view. In the background will be seen two chests of drawers, while in other parts are a feather bed, a pillow, a table, a broken bedstead, and other household articles reduced to wreckage.

The most remarkable landslide that has taken place in recent years occurred among the White Mountains of New Hampshire some eight or nine years ago. One of our photographs shows the scene of the disaster before the land commenced to move. The bowlder, fixed between the overhanging crags of rock, was regarded as one of the most interesting natural sights of America. It had been in its precarious condition from time immemo-

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This shows the main street of St. Louis after the cyclone.

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Valley before the landslide. This bowlder had hung in Crawford Notch for centuries.

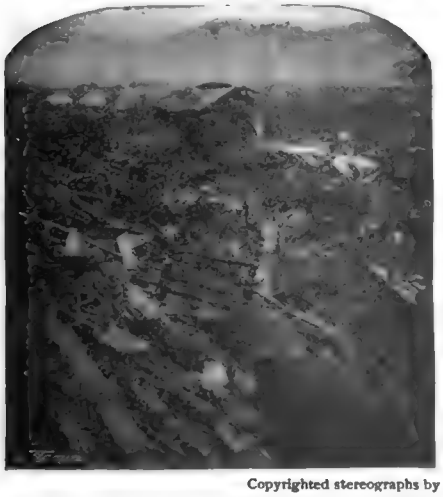
This is Crawford Notch after the landslide. A large farm was buried.

rial. The Indians declared that it had been there for hundreds of moons before the white man came to their country.

One day, some eight or nine years ago, there was a rumbling sound, and the cliff on the north side of Crawford Notch, as the ravine was called, slid with a crash into the chasm and valley below. A large farm was completely covered by the falling earth and rock, and no trace of the buildings can now be found, as will be seen by our photograph. Crawford Notch no longer exists. The remarkable change which has taken place in the landscape will be realized by comparing our two pictures of the scene.

Perhaps great floods are more to be dreaded than any other form of disaster. Not only are buildings destroyed, railway tracks torn up, and crops and trees carried away, but the after effects are far more calamitous than in the case of a cyclone or fire.

One of the most terrible floods, within the past few years, was that which occurred at Johnstown, Pennsylvania, in 1889.



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This is Johnstown after the bursting of the great reservoir.

A train entering Johnstown as the reservoir burst, with the above result.

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The Union Depot of Louisville after the tornado seemed an assortment of matchwood and scrap iron.

The Church of the Sacred Heart was destroyed.

The town lay in a valley with high hills on either side. At the far end of the valley a vast reservoir had been constructed to supply Johnstown and a number of smaller towns in the district with water. One day the dam, which must have been sadly neglected by the local officials, burst suddenly, and the enormous volume of water which the reservoir contained rushed down the valley like a torrent, carrying everything before it. A thousand people lost their lives in a moment, and for days the valley was converted into a huge lake of mud and water. Many of the bodies were carried by the force of the water on to the highlands above the town.

A train, coming into Johnstown, was met near the stone bridge which spans the valley by the onrushing current, and was completely wrecked, as shown in one of our photographs. Nothing remained after the water had subsided but a pile of *débris*. Another of our illustrations shows the general appearance of the fair valley after the flood. No town is to be seen—nothing but a mass of splintered wood and broken stone to mark the site of a once prosperous hive of industry and life.

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An incident of the Louisville tornado. The bird was caught in its flight and killed.

EFFECT OF A TORNADO, GRINNELL.

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We are able to publish a very curious photograph taken after the disaster. It is that of a brick building which survived the rush of waters. When the photograph was taken, the house stood in solitary grandeur amid a square mile of splinters and mud. Although it survived the rush of water, a large tree, growing by the side of the house, was uprooted, and, being driven by the waters, crashed through the side of the building, and fell into one of the rooms.

We must include in the present article another very striking photograph taken after the awful Johnstown flood. The photograph shows a house and tree which

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This house alone withstood the flood, but a tree growing alongside was forced through the outer wall.

stood by the side of the railroad track. When the waters came rushing through the valley the tree was uprooted, dashed through the upper wall of the house, and the building was then turned over on its side, as shown in the illustration, the tree remaining upside down in the opening which it had made in the side of the house.

The photograph brings to mind a curious fact in connection with the Johnstown disaster. When the vast volume of water rushed through the ill-fated valley, it carried nearly everything before it, smashing into splinters by its terrific impact not only trees and sheds, but large buildings and railway trains. (The *débris* seen in the foreground of our photograph is a ruined train which had been overtaken by the waters from the broken reservoir.) In the whole of the valley, after the flood had subsided and a survey came to be taken, it was found that in only two instances had the waters failed to work utter and irretrievable ruin. And here comes the curious coincidence. In both cases the survivors were a tree and a house, united by the force of circumstances.

Johnstown does not seem to have learned

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An extraordinary wreck. The great Johnstown flood uprooted a tree, drove it through the wall of a house, turning the latter upon its side. The appearance after the accident was as shown in our photograph.

a lesson by its terrible experience, for the old reservoir has been repaired, and stands in exactly the same place as before. The existing dam is of course a more powerful one than its predecessor, but there is always the awful possibility of a repetition of the calamity of 1889.

There is probably no risk which we run so great as that of being involved in a railroad catastrophe, and yet, considering the vast number of people who travel annually upon the railroads of the world, the loss of life is so infinitesimal as to be little less than miraculous.

On the next page is to be seen a truly extraordinary photograph of a peculiar acci-

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From a Photo.

These engines were travelling at a terrific rate when they collided, and the lighter of the two leapt upon the other engine.

dent that occurred on the northern division of the New York, New Haven and Hartford Railroad, near Worcester, Massachusetts, on February 2, 1897. A very heavy freight locomotive, with a snow-plough, was travelling at a high rate of speed along the line, when the driver suddenly saw a milk train coming round a curve in an opposite direction, but on the same line. The train was also travelling at a very high speed, and of course there was no time to avert a collision. The engines collided with an awful crash, and the heavier locomotive fairly ploughed under the lighter engine, which jumped the rails and crashed on to the top of the heavy engine.

Our photograph shows the locomotives in the positions which they occupied after the collision, certainly one of the most remarkable effects in the annals of railroad disasters.

An extraordinary accident took place some four or five years ago, between Gomshall and Chilworth, on the Reading branch of the Southeastern Railway in Surrey, England. A heavily laden freight train had mounted an incline to a point where the track descended again, when one of the couplings in the middle of the train gave way and the engine with the front wagons went down the hill. The other half of the train slowed down for a moment, but having turned the top of the incline, rushed down after its predecessor. No brakes being applied, it gradually gained momentum, until it dashed with terrific force into the first half of the train, the whole of the long line of wagons being mixed up in an almost inextricable mass of *débris*.

Had the train carried passengers instead of freight, it is practically certain that no one would have escaped death; but as it was, no injuries were reported. Our photograph shows how the engine and front wagons were derailed and hurled down the embankment.

Photo by J. Lloyd, Albury.

At the crest of a hill a freight train broke in half. The rear portion, at first left behind, gathered impetus and, following, dashed into the front half.

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From a Photo.

COLLAPSE OF A BRIDGE.

On March 15, 1887, a bridge across a street of Boston, Mass., gave way under a train. Many lives were lost.

A terrible disaster was caused by the collapse of a bridge at Boston, Massachusetts, on March 15, 1887. The scene after the catastrophe may be realized in some measure from the photograph which we publish. A street in the suburbs of Boston was spanned by a truss bridge, across which the railroad was carried. On the day in question a train approached the bridge, and the engine with the three foremost carriages passed in safety. The driver stated that he felt no jerk or anything at all unusual, but happening to look around, he discovered to his horror that the bridge, together with six of the carriages, had disappeared.

The man could scarcely believe his eyes, but he quickly brought his engine to a standstill, and on going to the edge of the embankment the full horror of the terrible catastrophe was visible. One carriage in falling into the street had struck a stone abutment, and was literally smashed to pieces, nearly every occupant being killed. Many other lives were lost, but there were also some miraculous escapes. The last car, for instance, a smoker, containing fifty people, turned completely over as it fell into the street; all the occupants were severely injured, but extraordinary to relate, only one was killed.

A truly curious photograph taken after the accident is that which shows the result of a disaster some time ago at the Montparnasse Terminus in Paris. A heavy locomotive and tender with a train of carriages failed to stop in time, and, crashing past the buffers, penetrated the front wall of the station and fell into

From a Photo.

A PARISIAN CATASTROPHE.

The train failed to come to a standstill on entering the station, and ran through the stops and across the platform, and finally fell, with its tender, into the street.

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the street below. The engine stood almost upon end in the roadway, the tender remained suspended above the entrance to the station, and the first carriage, which consisted of a brake van, projected over the coping. Previous to the removal of the *débris* and the suspended locomotive, thousands of people went to the spot to see so novel a sight.

Photo by G. W. Wilson.

A schooner which was driven upon the coast of Kincardineshire during a heavy storm eight years ago.

Neither in France nor England are railroad disasters so frequent as they are in this country. A few years ago, however, a terrible accident occurred on the Cambrian Railway Company's lines near Oswestry. A train containing among its passengers three hundred children jumped the rails, the engine and every coach being overturned. No fewer than nine persons were killed, and many injured. Owing to the position of the telescoped coaches, the work of rescuing the injured and recovering the bodies of the dead was most difficult.

The wrecks of large passenger steamers at sea occur at terribly close intervals, and the sights witnessed on board sinking ships are appalling. Few photographs of such accidents have been taken. In the first place, eye-witnesses are too much occupied and excited to think of their cameras; and secondly, these disasters usually occur at night or during the prevalence of thick fogs, rendering photography impossible. Hundreds of wrecks, however, occur on dangerous coasts, and many of these have been photographed. One of our illustrations shows a schooner, wrecked upon the coast of Kincardineshire, whither it had been driven by a terrific gale.

When our photograph was taken the storm had somewhat subsided, but, as will be seen, the sea was very rough. This wreck took place eight years ago.

Photo by J. Maclardy, Oswestry.

The train wrecked near Oswestry on June 11, 1897. It contained three hundred members of a Sunday-school out on their annual excursion, and of these nine were killed and many injured.

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THE ART OF THE CAMERA.

By Roderick Grey.

THE AMATEUR AMATEUR.

It has been decided beyond all question that the fixed-focus camera is the most serviceable for those persons who do not indulge themselves in too lofty ambitions with respect to photography.

After all, this comprehends a vast proportion of the individuals who use cameras. Photography as a scientific pursuit, or as an intricate art, has long been the hobby of a few. But photography as an intellectual, and not too difficult, amusement has, within recent years, gained so enormous a hold, simply and solely because it is exceedingly easy. Merely to carry a camera to a certain spot and then turn it on to the subject selected, and press a button, and leave other folks to do the rest, has much that appeals to many.

If it is a snapshot of individuals for the moment unaware of what is happening, the picture is a feat to be proud of. So much so is this that from such class of work has sprung that most trying of all creatures, the "camera fiend." The enjoyment seems to lie in getting the snap-shot and in the excitement of seeing the result. When once it has been developed and printed, the interest abates, and, after a laugh or two (very feigned on the part of the victim), the photograph is tossed aside.

However, the snap-shot may comprise a subject of more lasting interest, such as a street scene in some foreign town, or a peculiar building, and so on. Whichever it is, such photographers make no pretence of their photographs being works of art. They are kept as reminders of what the traveller has seen. The album into which they are pasted becomes, as it were, a collection of sketches.

FIXED-FOCUS CAMERAS.

Now it is perfectly obvious that the more complicated an instrument is, the greater is the skill required for its proper use. When it is used properly, it is, of course, infinitely more efficient than its simpler and less complex rival. But, unless it is properly understood in all its various ramifications, a most woeful result is sure to follow.

Here, then, is the secret of the advantage of fixed-focus cameras over those that focus, for such people as have no time, or more possibly, no inclination, to achieve an expertness in the use of a complicated apparatus. It is certain, of course, that the best picture obtainable by a fixed-focus camera, when surrounding circumstances are somewhat adverse, is immeasurably inferior to that produced by the better instru-

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Photo by Count Luigi Primoli.

A GLIMPSE OF MONASTIC LIFE.

ment; but it is equally certain that in the hands of two—what shall I say?—duffers, or, better still perhaps, beginners, the fixed-focus camera will be in all probability more successful than the elaborate focussing one.

It really amounts to this, that there is no great margin for mistakes in an ordinary fixed-focus camera. Given favorable circumstances, the little affair will do its own work for itself. But here we have the whole difficulty. It is just with respect to surrounding circumstances that we find ourselves so limited. We become

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Photo by Madame Lallie, Regent's Park.

A BUNCH OF ROSES.

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slaves without a chance of helping ourselves. If everything is not exactly right, we can only tuck our camera under our arm, and watch our more skilful companions take a photo with a camera rejoicing in a capacity to focus and in an iris diaphragm, or in a series of stops.

THE ADVANTAGES OF STOPS.

There is in the way of cameras a halfway house between the fixed-focus camera that is a mere toy, and the more elaborate combinations. This consists of a camera incapable of focussing, but, at the same time, fitted with an iris diaphragm or a series of stops. To explain the scientific reasons of the advantage and working of a diaphragm is, with respect to the learned and expert photographer, a matter of carrying coals to Newcastle; while to enter into elaborate details would be neither more nor less than tedious to the ordinary individual. Suffice it to say that, in a sense, the closing of the aperture, or, in other words, the using of a smaller stop, concentrates the rays of light, and, in a fixed-focus camera, is a substitute (up to a certain point) for focussing.

Photo by Madame Lallie, Regent's Park.

AN ENGLISH BEAUTY.

A SIMPLE CAMERA.

The majority of fixed-focus cameras are similar in quality. It may be a Frena, or it may be a Kodak, and there are many others. With respect to the Kodak, I can give some facts and figures of my own experience, and facts and figures are always useful. The principle at play is, however, identical, whatever the camera.

I will suppose, for the sake of argument, and for the purpose of giving my remarks a definiteness, that you are using a special No. 2 Bullet (or Bull's Eye) Kodak. Here you have a fixed-focus camera, and one fitted with an iris diaphragm.

THE USE OF DIFFERENT STOPS.

Now a snap-shot pure and simple is only possible (and by possible I mean really likely to turn out well) if the main portion of the picture is over 10 feet away, and if the light is good. Then the

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full aperture can be used. Such a photograph presents no vast difficulties. If the sunlight is fairly strong, the diaphragm can be reduced to F 8. There is no difficulty in this, and no learning is required, for the scale is marked and a pointer indicates the exact aperture. If the snapshot is on the sea, or if the sunlight is very strong, the aperture can be still further reduced to F 16. If you have the combination of sea and bright sunshine, you can still further reduce the aperture by stopping down to F 32. This, too, is the right stop for use with a time exposure if you are attempting a portrait, the sitter being anything beyond 10 feet from you. F 16 is, moreover, the correct stop for a time exposure when the subject is at a distance.

F 64 is absolutely useless for a snapshot; under no circumstances can it be anything but a failure. For time exposure out of doors, however, it gives you a very sharp result, far sharper and better than you could possibly get if you had a camera not fitted with stops. When your subject is a landscape, with plenty of sunshine, you can use the "lever" exposure, which means that the shutter is open as long as you keep the spring pressed down, when you must make as quick an exposure as you can.

The smallest stop of F 128 is, of course, only for use for time exposure.

THE BEST RESULT.

Now let me try and summarize the above information into something approaching a table. F 8 is for a snapshot in ordinary sunshine. F 16 is for a snap-shot on the sea, and for subjects not too close and with plenty of sunshine. F 32 is for snap-shots on the sea when the sun is bright, also for portrait work when the sitter is beyond 10 feet. F 64 is for time exposure out of doors and for portrait work within 10 feet, also for "lever" exposure for landscape. If there are light clouds, from a half to one second exposure is correct; if the clouds are heavy then from two to five seconds. It is also the best aperture for portraits out of doors with diffused light, the exposure being from four to eight seconds.

It is not to be supposed that the data I have given will prove absolutely complete or infallible. Still, it will prove of inestimable value and assistance to the amateur; that is, to the amateur who has a camera, and only a very small idea of how to use it. It will, too, tend to show how very much greater are the possibilities of a camera fitted with stops over the one which is not.

It is only a step from the hopelessly poor negative to the one worth preserving. In this step is needed knowledge more than skill.

Photo by F. Ollo.

AT THE PUMP.

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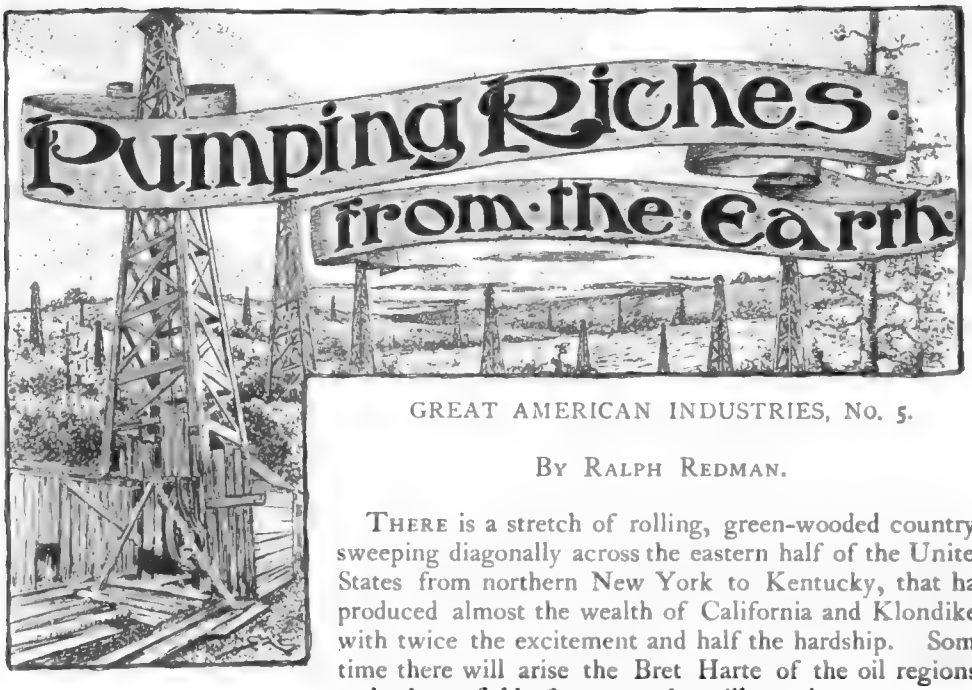

GREAT AMERICAN INDUSTRIES, No. 5.

By Ralph Redman.

There is a stretch of rolling, green-wooded country, sweeping diagonally across the eastern half of the United States from northern New York to Kentucky, that has produced almost the wealth of California and Klondike, with twice the excitement and half the hardship. Some time there will arise the Bret Harte of the oil regions, and what a field of romance he will reap!

There are few regions on earth in which the inhabitants are indifferent to gold mines. This is one. Let no inspired prospectus waste its allurements in the oil belt. What if a company *has* secured large tracts of Klondike soil or Cape Nome beach? What if "a few more feet of tunnel" *will* surely strike an auriferous vein in Colorado? The Titusville or Sistersville or Marietta man remains indifferent. He has a wealth-producing stratum under his feet that appeals to him with more effect. Why waste time on a toilsome tunnel or face the rigors of the Arctic circle when one, at his own door, may thrust a pipe down into the earth, and (perhaps) thenceforward sit at ease and watch Nature fountain dollars for him?

Fifty-seven million barrels of petroleum—never mind the odd hundreds of thousands—were last year pumped out of the earth through the hills and farms of Pennsylvania, New York, Ohio, West Virginia, and Kentucky. In value, that is something like eighty millions of dollars produced for the trouble of pumping, and in some cases Nature dispensed with the pump and spouted her riches gratuitously. There is nothing on the earth that shows more margin of profit for work done and money spent than an oil well—*if it produces*. Even a gold mine needs continual digging. But an oil well, if it doesn't flow of its own accord, needs only to be pumped, and it supplies the fuel to run the pump with.

There is no human enterprise that does not partake in more or less measure of the elements of gambling. Drilling for oil is almost pure gambling, with Nature for an adversary. But the stakes are not high, and the odds given are tremendously in one's favor. If you win, you win heavily; if you lose, you do not lose greatly.

Small wonder, then, that the oil-bearing country is speckled with wells, productive and otherwise. Small wonder that, for mile after mile, the green hills and the sweeping farms are pimpled with derricks and tanks. Those derricks—square, ugly, gaunt skeletons—rear themselves in some districts as thick as fruit trees in an orchard; from roadside to crest of hill as far as you can see. In some, the slow-moving pump-beams show a producing well. In others, the dead machinery and the tumble-down buildings

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are the record of a game played out, or a stake that Nature won.

There is nothing pretty about an oil well. Ugliness could scarcely be pushed further than in the unpainted derricks and the rough-hewn wooden machines. Moreover, they are oily, greasy, dirty things, that seem to have the power of defilement through mere approach. And the headachy odor of crude oil is all about. There is nothing pretty about an oil well, but in its practical results it is one of the best things ever raised on a farm.

Here's a typical group on this farm. There are eight ugly derricks, scattered over a two-acre tract. Each has its cumbrous wooden pumping machinery, "home-made" affairs, strongly suggestive of pioneer days. A gasping gas-engine in the centre of the tract is connected with the eight pumps by eight ramifying wire ropes. The engine gurgles and grunts, the ropes slowly tighten, the distant pump-beams rise in response, painfully, with creaks and groans. As if exhausted, the engine relaxes its pull suddenly; the ropes fall slack, the pump-beams sink. And so it goes, fifteen or twenty strokes to the minute, all day long, and perhaps at night also. There is nobody about; we are in the middle of a huge pasture. There is no sign of life, unless you can so designate the awkward, rhematic movements of the pumps, the swaying ropes, and the gasping of the laboring engine. You realize that one man can attend to all this and have ample leisure to hoe corn besides. The gas from the wells themselves runs the engine; there are practically no running expenses to cut into profits, and each stroke of the pumps means perhaps a half-pint of oil raised from the depths among the eight wells. Not much, you think? Truly, these are not heavy producers, but figure a little. A half-pint at a stroke means about a gallon a minute, sixty gallons an hour, 720 gallons—about seventeen barrels—in twelve hours. Oil is worth

GROUP OF EIGHT OIL WELLS—SMALL PRODUCERS—ALL PUMPED BY A GAS-ENGINE IN THE SHANTY AT THE RIGHT, BY MEANS OF CONNECTING WIRE ROPES.

$1.40 a barrel to-day, and, as will be seen further on, there is absolutely no further expense to be figured in marketing the product. There is $23—nearly $24—a day income *without bother*. The only expense is the wages of one man at $50 a month, interest on the cost of a cheap equipment, and infrequent and inexpensive repairs. The man who owns these wells gives one-third of all the oil to the owner of the farm on which they are drilled. Yet he *nets* about $500 a month from these eight wells—only one group of many that he operates—and seldom troubles to see them. These wells have been going along steadily at their present rate for eight years. There is a well near Tidioute, Pa.,

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that has been pumping at an average rate of five barrels a day for more than twenty years.

If it pays thus to pump wells that give only a barrel to two barrels of oil a day, what of a well that gives 50 to 100 barrels a day? What of the "old days," when there were wells that spouted 1,500 barrels a day with oil at $10 a barrel? Gold mines! Pshaw! what's a mining claim to a well like that?

Wherever you go throughout the oil regions, from New York to Kentucky, you cannot get away from the *pipes*. This group of wells before us is seven miles from a town, and to be reached by a road over the hills little better than a cart-track. Yet all along the side of that cart-track as we came along was a two-inch iron pipe, simply laid along the surface of the ground; dipping into hollows and rising over hills; crossing little streams with a naked stretch of tubing, and every few hundred yards throwing out a side-pipe across the fields. And here it is again, with branches to every one of these wells, and further still it extends, you can't tell how far across country; but wherever there's a producing well there's the pipe. Fancy how the 1,000-mile stretch of oil country must be cobwebbed by tubing.

People who do not live in this favored region are generally surprised to be told that petroleum was *not* a "lucky discovery," nor a discovery of comparatively recent years. All the books on the petroleum subject, even the encyclopædia articles, begin with the statement that "petroleum has been known since the earliest times, the ancient Egyptians used it, the Greek historians told of springs of it," etc., etc. Yet it does stick in the mind of most of us that petroleum is distinctly an American institution, and that it came into our economics just before the Civil War.

It is not exclusively an American product; it is found all over the world. Russia apparently has more of it than we. It is to be found in England in small quantities, in Japan, in Africa, in Borneo, in Sumatra, in India. But it was in America that its use was developed, and it was America that taught the world how to get it out of the ground.

The history of petroleum is one of the most exciting stories ever told. Nothing in fiction can compare with it for sustained interest, tragedy, pathos, and incident. And it is astonishing how little is known of it outside the oil regions themselves.

Nature did her level best for centuries to impress upon man the value and abundance of her oil storage. She threw out broad hints in oil springs, that flowed petroleum like so much water. She even burned a huge torch at Baku, in Russia, for ages, to show the illuminating power of the product. But man heeded not. In early American days he used to drill artesian wells to get the salt water that is always found near oil deposits, and when he struck the oil and gas, as he often did, he was disgusted because it spoiled his salt, and tried again elsewhere. In Kentucky, for example, an industrious pioneer drilled for salt water, and was annoyed at the "ill-smelling oily stuff" that filled his well. He abandoned that well and started another, but the "ill-smelling stuff" would not be denied. It overflowed in the first well, and floated down the surface of a neighboring stream. Somehow it got afire, and there were, it is said, twenty miles of flaming river. The inflammability of the oil was well known; it had even been burned in lamps, and its value as an illuminant dimly recognized. But still men kept boring for brine and calling it unfortunate if they struck oil instead.

We owe much to Samuel M. Kier, a Pittsburg druggist. He used to pay sixty cents a gallon for oil collected from springs, from the surface of streams, and from "unlucky" salt wells—for what purpose? To use in lamps or for a lubricant? Not at all. For years he bottled it and sold it as a "wonderful natural remedy" for rheumatism and sores. Another firm collected the oil in the same way and for the same purpose—it was "Seneca Oil," a name well known to our fathers. Meanwhile there were numerous concerns engaged in extracting an illuminant from the

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oily shales, and finally Mr. Kier was induced to try the refining of petroleum for this purpose. He built a small refinery at Pittsburg, and made "carbon oil," which had a ready sale for some years, though burned in chimneyless lamps which developed more smoke than light, and more smell than anything.

This was about 1850, and there soon arose a steady demand for petroleum which could not be supplied with the primitive methods of collection then in use. It was obtained only by skimming it from the surface of streams, or by sinking shallow pits in oil-soaked earth. Strangely enough, though drilling for salt water was a recognized industry, and though oil was struck frequently when such wells were drilled, it was years before any one thought of drilling for *oil.*

The story goes that one George H. Bissell, a New York lawyer, who had some interests in the oil operations as then conducted, was driven under the awning of a drug store one day in August, 1856, to escape a passing shower, or (according to others) to get a few moments rest in the shade. In the window of the store was a bottle of Kier's oil; the "wonderful natural remedy." The bottle bore a label which stated that the oil was found while drilling for salt water, 400 feet underground, and the label bore a picture of a derrick such as was used in drilling *salt* wells. It at once occurred to Bissell that if oil were found in a well drilled for salt water, it might be found in a well drilled expressly for oil. A company was formed, capital secured, and on August 28, 1859, oil was "struck" at a depth of 69 feet in a well sunk near Titusville, Pa., by the company's manager, Col. Edward L. Drake. The credit for the first oil well is generally given to Drake, but it seems that it would be only fair to recognize the claim of Bissell as at least the originator of the idea. There is no question that the practical execution of the idea was by Drake, however.

From that time until now the story of petroleum has been a tale of wonder. It is a story full of thrill. It is made up of tales of daring and death; of disaster and triumph; of poor men rich in a day and of rich men made poor in a night; of colossal fortunes built on the ruins of failure, and of colossal failures incubated from success.

Read of that man who had spent his last dollar on the sinking of a well—and found no oil. Read of the way he went about begging for a little more money to sink it a few feet more—in vain. Read of that rainy afternoon when, actually faint with hunger, he went alone to his well, and "kicked" the drill down by foot-power a hand's breadth deeper; and of the mighty rush of oil that followed—a flow at the rate of 2,000 barrels a day with oil at $6 a barrel. Read of that association of prospectors who secretly sunk a well in new territory, and at the critical point were rewarded with such a burst of oil and gas as convinced them that they had struck the largest producer on record. Read of how they cannily corked the well up in order to do a little gambling on the Oil Exchange, in anticipation of the certain drop in oil prices that would follow the publication of their success. And read of how they subsequently uncorked the well with *éclat*—and got no oil. That first burst was *all.*

Then there's the story of that woman who dreamed that she saw a mighty "gusher" in a certain green glade, and, though dreaming, had waking sense enough to note the locality carefully. Then she went about hunting for that locality, and after a few days found it in actual fact. It was far from what was known as productive territory, but, in spite of opposition and derision, she sunk a well, and struck a fortune. That is the story, and the well was an undoubted fact. You are not forced to believe in the dream, although all oil men did and do. The stories of paying wells that were located by clairvoyants would fill pages. So would the stories of wells similarly located that did *not* pay.

This petroleum story being more than forty years long, and being crowded with incident as no other tale ever told, is one that can be detailed only in a series of

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volumes. The principal scene is laid along the banks of Oil Creek, Pa., and within a radius of fifty miles thereabouts; the time from 1860 to 1870. But it is still going on. After Pennsylvania, there was Ohio and Kentucky and West Virginia. Kansas and Colorado and California have added chapters of their own. And within a month the papers told of a wonderful gusher struck in eastern Pennsylvania, in territory that had never been seriously suspected of concealing oil. The story of petroleum is very far from being a tale that is told. But the Standard Oil Company has taken most of the romance out of it in recent years, and the "gusher" is very seldom heard of nowadays. There seems to be oil enough, but there is no doubt that there is not so much oil as there used to be.

Let us come back to our group of wells, with their awkward, creaking, wooden machinery. How were they sunk?

First, a "derrick" was erected and an engine set up. The engine operated a "bull wheel," which is a big wooden reel, on which is wound some thousands of feet of rope. At the end of the rope is hung the string of "tools." Details are unnecessary, perhaps, but there is a long iron rod, and a contrivance known as "the jars," and a long steel drill at the bottom. The whole weighs hundreds of pounds. The engine turns the wheel, the rope winds up a few feet, the string of tools is lifted a little and then dropped, full weight. The point of the drill cuts into the rock, and the operation goes on until the oil sand is reached or the well abandoned as hopelessly "dry." The stone chips are removed by pouring water into the well, which makes mud of the drillings, and then baling out the water and mud. The speed of drilling varies widely according to the character of the rock attacked, but twenty to thirty feet a day is pretty good work.

The depth of the well also varies according to the territory. In the Pennsylvania region the depth is from 100 to 700 feet. The further west one goes the deeper he must dig. In the West Virginia field the wells go down in some cases to more than 3,000 feet. That sort of a well may cost $10,000 to sink; the stakes are high in that field. From $1,200 to $2,000 is nearer the average cost of the wells in the present productive territory.

The oil is found in what is known as the "oil sand," a sort of sandstone, always in more or less close relation with salt water and natural gas. There are several strata of this oil sand. They are found at varying depths, and the principal "veins" of them, as stated, extend southwesterly from Gaspé Bay in Nova Scotia to central Kentucky. But these are by no means *all* the oil sands there are. They have been found in many other States, especially in Kansas, Colorado, Dakota, and California, and new veins are being found continually.

What is petroleum? Nobody knows. Chemically it is little else than carbon and hydrogen in variable combinations. But how those elements came into combination, and why that combination is where it is, are questions that geologists cannot definitely answer. It is generally agreed that petroleum *doesn't belong* where it is found; that is, that it was not originally a part of the sandstone. It came from somewhere else after the rock was formed or while it was forming.

There are three leading theories to account for its creation and presence, of which this is perhaps the best believed:

It is thought that petroleum is the oil that has resulted from the decomposition and distillation of animal or vegetable matter; chiefly animal matter. That is, that the oil you burn in your lamps is *fish oil*, distilled by nature from inconceivable millions of Silurian carcasses. It is supposed that all the territory under which oil is now found was once ocean-covered; that in the steamy Silurian days animal and vegetable life flourished in the waters to an extent we cannot conceive in these colder and later times. That in western Pennsylvania and eastern and central Ohio, where oil is most plentiful, there was a veritable Sargasso Sea. That in

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the course of the crinkling and folding of the earth's crust, the Appalachian mountain range was lifted into the air, and tilted up with it the country on each side of it, as the raising of the ridge-pole slants up the sides of an A-tent. So New England and the Middle Atlantic States became dry land, and so also the bottom of the Silurian sea to the west was lifted above the surface, carrying its multitudinous life with it—to extinction. Other changes in the crust in the course of ages buried this ancient ocean bottom hundreds of feet deep. The ooze and sand of the old ocean bed became the present shale and sandstone, and the pressure and heat distilled the carcasses into a thick and heavy oil, which permeated the hardening rock.

Petroleum is always found in more or less close association with "natural gas" and salt water. As a general thing all these exist in the pores of the "oil sand" or in the shales immediately below. Occasionally a crevice is struck which leads into a sort of cavern in the rock, and then the well is a "gusher." But in nine cases in ten the oil is pumped from the very sand or rock itself. That sand or rock is thoroughly saturated with the oil, and under the ever-present pressure of gas, or the suction of the pump, it oozes through the pores of the rock in quantities that depend on the amount present and the pressure upon it and the character of the rock.

Wherever there is petroleum there is paraffine. Paraffine is the familiar, waxy substance of which candles are made; you might call it hardened petroleum. Now, when the pump goes down into the oil sand and the oil begins to ooze through to its exit, it leaves much paraffine in its wake, and by and by the pores of the rock are choked up with it. Result —no oil for the pumper. Many expedients have been tried to get rid of the paraffine, but none proved efficacious until the nitroglycerine torpedo was perfected.

Simply stated, the torpedo is a copper cylinder holding as many quarts of nitroglycerine as are desired, with a detonating fuse. The cylinder is lowered to the bottom of the well, and exploded by dropping a weight down the string which lowered it, or, in late days, by electricity. The explosion tears up things down below. The rock is rent and shattered, crevices and channels are opened all through it, and the back pressure, after the explosion has spent its force, shoots oil and water and gas and everything that can be moved up through the well. The well may then go on pumping freely for days or months or years.

There are many stories told of the "torpedo men" of the oil region. Constant familiarity with the dangerous liquid gives them an appearance of "nerve" in its handling which is sometimes really nerve, sometimes recklessness, and sometimes mere carelessness. There is a long list of nitroglycerine accidents, of course, and they almost invariably end with some such statement as this, "And of the unfortunate men not a vestige remained."

It is probably not an overestimate that, in the early days, one-third of the oil that issued from the big "gushers" was lost. What was a man to do with a well that spouted 2,000 or 3,000 barrels a day and refused to be corked up? Even if tankage and barrels were at hand, they would soon be filled, for transportation was slow and uncertain. There was a time in the middle sixties when the cost of barrels, teaming, taxes, and brokerage, *without counting the value of the oil*, made a total between $10 and $11. Nowadays, a barrel of oil costs less than $5, barrel and all. And no oil is wasted.

This economy has been effected by the pipe lines, and by the centralization and systematizing of the business, more than through any increase in the production of oil.

All through the oil region thousands and thousands of throbbing pumps are sucking the petroleum from the earth. And for every pump there is a pipe, as for every heart there is an aorta. But this magnificent arterial system is built on the opposite system from that of the body. The heart pumps into a main pipe that

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sends its ramifications through the body; the oil pumps send their pulses through their separate thousands of small pipes, and these are brought together into the huge trunk lines that carry the oil to lake and ocean. And there is no return system. The oil pumped is lost to the earth, except for such fleeting illumination or lubrication as it can accomplish.

The extent of the pipe-line systems of the country is something unknown to everybody except the owners thereof. Detailed information concerning them is not cordially tendered by the owners to the public. Even if it were known in miles of pipe and gallons conveyed, it would be knowledge that would probably be lost on the casual reader for want of the power to appreciate the true meaning of the figures.

The productive oil fields of the Eastern United States cover extensive sections in seven States. In some places the wells are as close together as the houses in a town; in others they are in little groups separated by miles. But the pipes are everywhere there is oil, whether the wells are single, in groups, or in a forest of others.

Whenever a new well is being drilled, the pipe-line agent has his eye upon it, and the eye of the owner is also upon the pipe-line man. If oil is struck, a pipe is laid to the well as certainly as a water pipe is laid to a new house in a city. Sometimes it is nip and tuck between the well and the pipe layers in the race to connect the pipe before the well overflows its tankage. Sometimes after the pipe is connected it is a week-long race for the little steam pumps to push the oil away to a market as fast as it comes from the ground. But there is little waste nowadays.

The well empties, in the first instance, into a tank. The various tanks in a group of wells are generally connected with a large central tank. When this is full a "gauger" is sent for. He is a pipe-line employee. He measures the depth of the oil in the tank, then turns the cock that allows the oil to enter the pipe line. As soon as the tank is emptied down to the "bad sediment" near the bottom, the cock is turned off, and the depth of oil remaining measured again. The difference between the two levels, through a formula already figured out for each tank, gives the exact quantity of oil run off. This is called "making a run."

A certificate is given to the well-owner, and a duplicate goes to the central office of the pipe-line system for the particular field or section in which the well is located. This certificate is a real "certificate of deposit," and goes on the books of the company to the credit of the well-owner. If at any time he wishes to realize on his oil, he can apply to any of the many offices of the company scattered through the oil regions. His credit balance at the office of his own field is ascertained by wire, and he can draw the money for as many or as few barrels as he desires. The National Transit Company —the company that controls eight-tenths of the pipe lines of the country—is like a bank with numerous branches. One may deposit oil at any one branch, and draw money at that or any other branch.

But the owner may not realize on his oil in a month. Meanwhile what has become of the oil? It has flowed, or has been pumped, through miles of pipe; perhaps through thousands of miles. From the well-tank it has passed along over field and hill and through glen and forest toward the nearest central reservoir of the Transit Company. From that it enters a system of trunk lines with an eventual destination at some refinery.

A large proportion of it goes to the immense refineries at Bayonne, N. J., Hunter's Point, L. I., and Whiting, Ill., near Chicago. It reaches them by way of trunk lines of steel pipe from four and a half to eight inches in diameter. The oil goes East by means of four or more six and eight-inch tubes, more than 500 miles long, extending across Pennsylvania, northern New York, and the Appalachian mountain range. In the whole trunk-line system of the National Transit Company are more than 5,000 miles of pipe. This is *trunk-line* pipe, remember.

Another pipe runs to Philadelphia, an-

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other to Baltimore, another westward to the lakes at Cleveland. At intervals of twenty-five or thirty miles is a pumping station. The oil is received in a system of huge tanks, and from those tanks is again pumped forward to the next station. By careful measurement a leak can be detected almost at once.

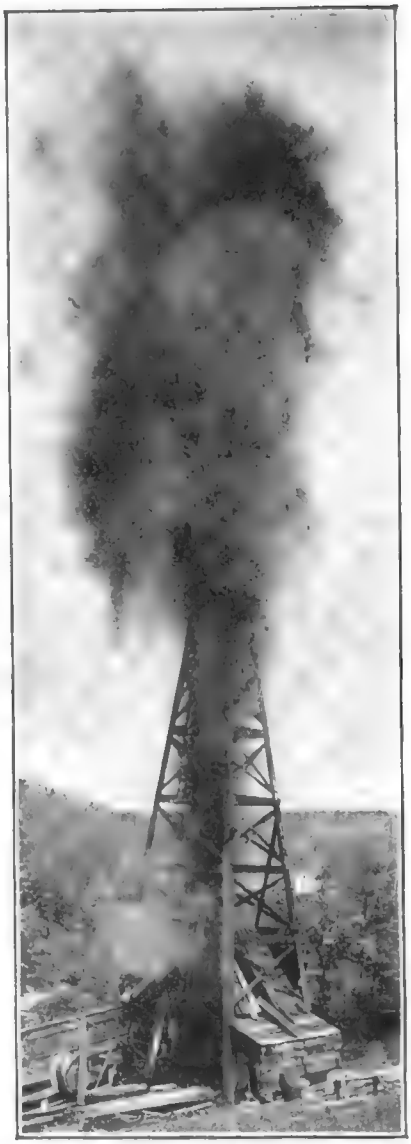
The paraffine bothers the pumpers a good deal. It collects on the inside of the pipes and chokes them up. So at intervals a scraper is sent through. The pipe-line men call it a "go-devil." It is a little machine eighteen inches long with fan blades and scrapers. The current of oil sends it along steadily, and at the same time revolves the blades. These cut the paraffine from the inside of the pipe, and it goes through and out with the oil. The men can tell to within a minute when to expect the "go-devil" at the further end.

At the refinery the petroleum is turned into oil of differing grades, by distilling it. Roughly, the process is this: The petroleum is put into a tank, under which is a slow fire, burning the gas from the oil itself. As the latter warms up, the vapors pass through a long pipe, and are cooled in the process, condensing into liquid again.

The first thing that "comes over" is a gas, which is used as a fuel in the works. Next, the varying grades of naphtha; next (the product becoming heavier and heavier all the time), the gasolene grades, then the low-test kerosenes, then the high-grade kerosenes. Then come a long list of heavier oils, ending with the heaviest and thickest of lubricants. There is left in the tank paraffine and a black, dense, sticky substance which is little more than asphalt. From these bi-products, after the refining of oil, are made more than 150 substances of value, including such familiar things as dyes, soap, vaseline, ointments, and chewing gum.

The story of the Standard Oil Company has filled many books, and will fill many more. This is not the place to go into it. It is the richest corporation in the world, one of the best managed, and one of the worst vilified.

You can generally measure success by the amount of abuse the successful one receives, and by this standard the Standard Oil Company is one of the most successful on earth. It has been accused of about all the crimes in the code, including murder and arson. As it has never had a fair trial, many of these accusations have "stuck." But there is another side which the company could undoubtedly tell, if it cared to, and a side also which any one who cares to see, may see.



A BURNING WELL.

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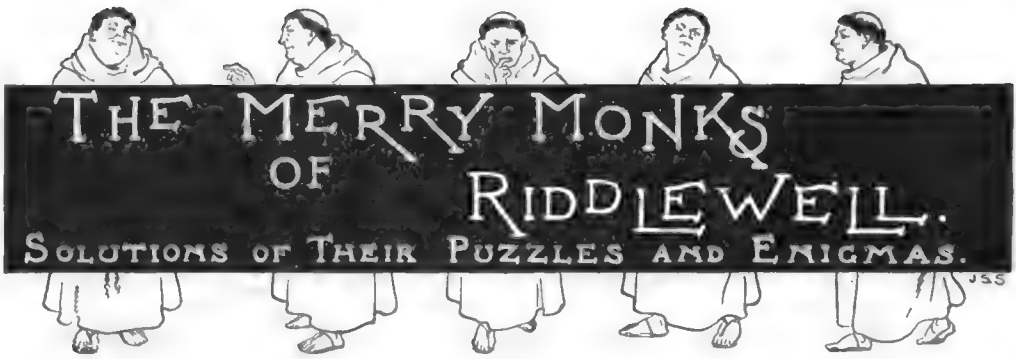


By Henry E. Dudeney.

THE RIDDLE OF THE FISHPOND.*

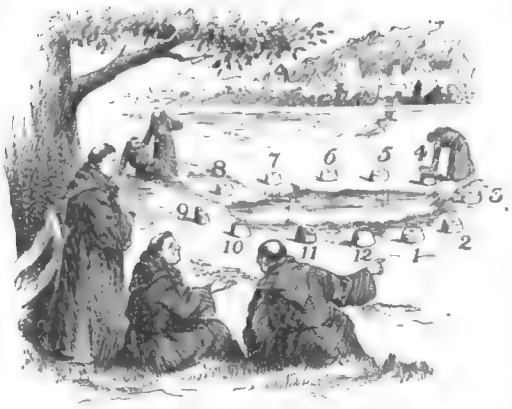
Number the fish baskets in the illustration from 1 to 12, in the direction that Brother Jonathan is seen to be going.

Take the fish from No. 1 and place it in basket No. 4, take from 10 to 2, from 8 to 12, from 5 to 9, from 3 to 6, from basket 7 to basket 11, and then complete the revolution to basket No. 1. The trick has thus been performed in as few as four revolutions.

THE RIDDLE OF THE PILGRIMS.

If it were not for the Abbot's conditions that the number of guests in any room may not exceed three, and that every room must be occupied, it would have been possible to accommodate either 24, 27, 30, 33, 36, 39, or 42 pilgrims. But to accommodate 24 pilgrims, so that there shall be twice as many sleeping on the upper floor as on the lower floor, and eleven persons on each side of the building, it will be found necessary to leave some of the rooms empty. If, on the other hand, we try to put up 33, 36, 39, or 42 pilgrims, we shall find that, in every case, we are obliged to place more than three persons in some of the rooms. Thus we know that the number of pilgrims originally announced (whom, it will be remembered, it was possible to accommodate under the conditions of the Abbot) must have been 27, and that, since three more than this number were actually provided with beds, the total number of pilgrims was 30. The accompanying diagram shows how they might be arranged, and if in each instance we regard the upper floor as placed above the lower one, it will be seen that there are eleven persons on each side of the building and twice as many above as below.

* These riddles were published in the June number of this magazine.



THE RIDDLE OF THE FISHPOND.

THE RIDDLE OF THE TILED HEARTH.

The correct answer is shown in the illustration. No tile is in line (either horizontally, vertically, or diagonally) with another tile of the same design, and only three plain tiles are used. If, after placing the four lions, you fall into the error of placing four other tiles of another pattern, instead of only

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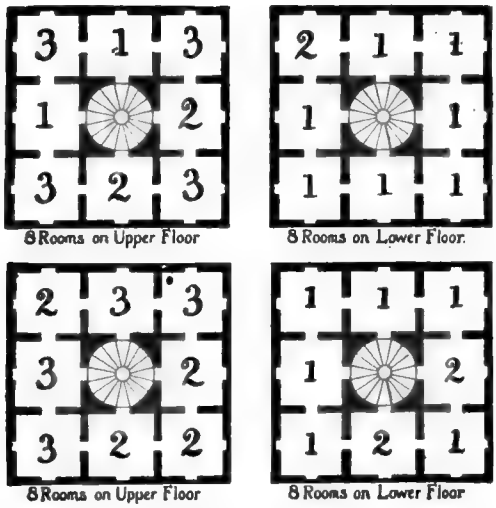
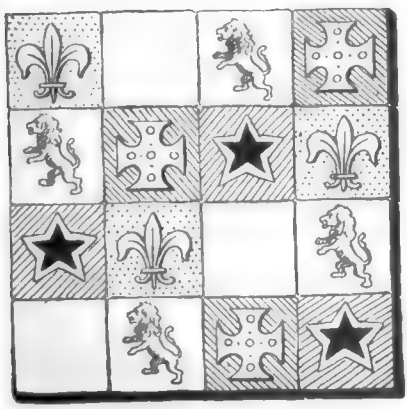


THE RIDDLE OF THE PILGRIMS.

three, you will be left with four places that must be occupied by plain tiles. The secret consists in placing four of one kind and only three of each of the others.

THE RIDDLE OF THE SACK WINE.

The question was, Did Brother Benjamin take more wine from the bottle than water from the jug? Or did he take more water from the jug than wine from the bottle? He did neither. The same quantity of wine was transferred from the bottle as water was taken from the jug. Let us assume that the glass would hold a quarter of a pint. There was a pint of wine in the bottle and a pint of water in the jug. After the first manipulation the bottle contains three-quarters of a pint of wine, and the jug one pint of water mixed with a quarter of a pint of wine. Now, the second transaction consists in taking away a fifth of the contents of the jug, that is one-fifth of a pint of water mixed with one-fifth of a quarter of a pint of wine. We thus leave behind in the jug four-fifths of a quarter of a pint of wine—that is, one-fifth of a pint—while we transfer from the jug to the bottle an equal quantity (one-fifth of a pint) of water.



THE TILED HEARTH.

THE RIDDLE OF THE CELLARER.

There were 100 pints of wine in the cask, and on thirty occasions John the Cellarer had stolen a pint and replaced it

THE FROGS' RING.

with a pint of water. After the first theft the wine left in the cask would be 99 pints; after the second theft the wine in the cask would be $\frac{9801}{100}$ pints (the square of 99 divided by 100); after the third theft there would remain $\frac{970299}{10000}$ (the cube of 99 divided by the square of 100); after the fourth theft there would remain the fourth power of 99 divided by the cube of 100; and after the thirtieth theft, there would remain in the cask the thirtieth power of 99 divided by the twenty-ninth power of 100. This, by the ordinary method of calculation, gives us a number composed of 59 figures to be divided by a number composed of 58 figures! But by

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the use of logarithms it may be quickly ascertained that the required quantity is very nearly $73\frac{79}{100}$ pints of wine left in the cask. Consequently the cellarer stole 26.03 pints. The monks doubtless omitted the answer for the reason that they had no tables of logarithms, and did not care to face the task of making that long and tedious calculation in order to get the quantity "to a nicety," as the wily cellarer had stipulated.

THE RIDDLE OF THE CRUSADERS.

The correct answer is that there would have been 60,176 Crusaders, who could form themselves into a square 776 by 776, and after the stranger joined their ranks, they could form 113 squares of 5,329 men —that is, 73 by 73.

THE RIDDLE OF ST. EDMONDSBURY.

The reader is aware that there are prime numbers and composite whole numbers. The former cannot be divided by any number, except 1, and leave no remainder; while the latter are composed of factors, and therefore can be so divided. The number of divisors depends obviously on the number of factors. Now, the number of mice, 999,919, cannot be a prime number, because, if it were, the only possible answers would be those excluded by Father Peter—1 cat killed 999,919 mice; or 999,919 cats each killed 1 mouse; and, if the riddle is to have only one answer, the number must be composed of only two factors. What are those factors? They are 991 and 1,009, both of which are primes. But we are told that each cat killed more mice than there were cats; consequently, the solution cannot be that 1,009 cats each killed 991 mice. The correct answer is then clearly that 991 cats each killed 1,009 mice. Multiply one number by the other, and the product will be found to be 999,919 mice.

THE RIDDLE OF THE FROGS' RING.

The fewest possible moves in which this puzzle can be solved is 118. I will give the complete solution. The black figures on white disks move in the direction of the hands of a clock, and the white figures on black disks the opposite way.

The following are the numbers in the order in which they move. Whether you have to make a simple move or a leaping move will be clear from the position, as you never can have an alternative. The moves enclosed in brackets are to be played five times over: 6, 7, 8, 6, 5, 4, 7, 8, 9, 10, 6, 5, 4, 3, 2, 7, 8, 9, 10, 11 (6, 5, 4, 3, 2, 1), 6, 5, 4, 3, 2, 12 (7, 8, 9, 10, 11, 12), 7, 8, 9, 10, 11, 1, 6, 5, 4, 3, 2, 12, 7, 8, 9, 10, 11, 6, 5, 4, 3, 2, 8, 9, 10, 11, 4, 3, 2, 10, 11, 2. We thus have made 118 moves within the conditions; the black frogs have changed places with the white ones, and 1 and 12 are side by side in the positions stipulated.

TO MY LADY.

Lady with the gracious eyes,
If thou doth my love despise,
And flout me,
Never will I sing again;
Song and life alike were vain
Without thee.

Lady with the dimpled chin,
Laughing loves creep out and in
To hide there;
Dimples fashioned by a smile,
Showing sunbeams all the while,
Abide there.

Lady with the cherry lips,
Happy is the bee that sips
Such dainties;
I'm, alas! no roving bee,
Only one whose heart for thee
So faint is.

Lady with the voice that thrills
Like the ripple of the rills
Descending,
Be thou kind, or cold as snow,
For thee I'll devotion show
Unending.

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MEMORIES OF FIFTY YEARS.

By Stuart Robson.

CHAPTER I.

"MANY YEARS AGO"—CONGRESS IN 1850.

Joseph Jefferson once said that almost every man has one book in him, and, I suppose, on the same line of thought, one might reasonably be certain that every man had, at least, a couple of magazine articles in him, and stood a greater chance of being forgiven in the final summing up of things if he did not try to make a book out of them. I don't mean to be cynical, but it always seemed to me that the best biographies were never written. The men who can get most from their fellow-creatures seem quite unconscious of it, and probably never thought what good "stuff" there was in it. When a man gets to considering whether his life is interesting or not, he begins to sum up opinion, and, as a rule, where the actor sums up an opinion he is inclined to forget one kind entirely. We are all weak in this respect, but a little instance that occurred several years ago rather lessened for me the value of opinion.

STUART ROBSON AS "OLIVER GOLDSMITH," 1899-1900.

An actor and dramatist, one of the best known men in America, came into my room one day while I was playing in Washington, and, with tears in his eyes, showed me a letter from his wife, which, if true, revealed a remarkable condition of affairs—she was virtually starving. I had loaned him considerable money before this, and I refused point blank to aid him any more, as I did not see that there was any visible end to his requests. He begged and implored me for assistance, however, and I finally gave in and loaned him a hundred dollars. That night, after the play was over, I went to Chamberlin's, and, going in, met the genial proprietor.

"Blank Blank is upstairs," he said; "I suppose you know it."

The fact that the man had been fairly intimate with me some time before and that he was a member of my profession was the reason for this information.

"Upstairs?" I said, in amazement.

"Oh, he is just giving a little dinner to some friends."

"Blank Blank giving a little dinner?"

"Oh, just a very informal affair—nothing to amount to anything."

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"Are you sure it is Blank Blank?" I said, very much amazed.

"Oh, yes. But it is not anything important," he said. "There are only half a dozen people there, Senators So-and-so"—naming some of the foremost American statesmen.

After I recovered my breath, I said to Mr. Chamberlin:

"I have reason for asking this question. About how much, confidentially, will this 'little dinner' cost?"

"Oh, not more than forty or fifty dollars," he replied.

My blood boiled. That afternoon that man had gotten down on his knees and begged me for money to send to his starving wife, and now he was giving a dinner to members of the Senate.

"In what room is he giving the dinner?" I asked.

Chamberlin directed me to the room, and I went upstairs. As I mounted the steps I saw that the door of the room was open, and I could hear Mr. Blank Blank responding to a toast that some one had evidently proposed in his honor. As I came near the head of the stairs, he saw me over the heads of the guests, though they did not. Apparently continuing his speech without change, but in reality speaking for my benefit, though he pretended not to see me, he went on:

"And when that glorious day comes, the great arts—poetry, painting, sculpture, architecture, and acting will be united under one glorious protective band. But, gentlemen [and here is where he made his change], it is a curious thing that the higher up a man goes in the art of acting, the more debased, the more mean, the more servile its representative men become, but—oh, how glad I am to say it!—there is one noble exception; a man of honor to his profession, perfect as an actor, glorious as a human being, a man whose career has been an honor to the stage, and a model to mankind—I speak of Stuart Robson."

I leaned against the wall a moment for support, and then feebly tottered downstairs, disarmed and overcome.

To begin, after the fashion of the Scripture, "in the beginning," my first recollections of the stage are very dear to me, as they are associated with names that afterward became famous, one in a great, noble way, and the other in connection with one of the most lamentable incidents in history. I was not quite fourteen when my family moved to Baltimore, where I very soon came to know as schoolmates John Wilkes Booth, Edwin Booth, and John Sleeper Clarke. Edwin Booth being several years older than John Booth and myself, I saw very little of him.

The only time I ever came in close contact with him was once when he and my big brother and J. S. Clarke gave a performance of "The Shivering Idiot," a very sad play in seven acts, in a big garret room of my father's house. I remember there was a placard on our back gate which read, "Boys, 3 cents; small boys, 2 cents."

For some slight offence my mother had prohibited my appearance in the garret that afternoon, but ambition will mount, you know, so up I went. Edwin Booth had the heavy *rôle*, and it was the duty of his brother Wilkes to tie him to a tree and saw his leg off, "assisted by the full strength of our very powerful company." It was my part to raise an axe, which had been previously covered with stage blood, and chop his head off to slow music—banjo, triangle, and bones. I stepped forward, spoke my little piece as if I meant it, and fiercely raised the axe, when I heard my mother coming upstairs and calling for me in tones that promised "a light wind, followed by a sharp gale."

I dropped the axe and fled, the indignant actors after me with reproaches for breaking up the show, and the audience—six boys and three girls—clamoring loudly for the return of their admission fee.

I saw the elder Booth once or twice at his home, but have not a very distinct recollection of him. My mother used to tell me that at one time he sold the products of his farm at Bellaire, Md., and that she had purchased vegetables from him.

Years after, when I came to know Ed-

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win Booth more intimately, and when we were talking about his father, he would protest most vehemently against a current misunderstanding of his character.

There is a singular story told of the elder Booth, and although Edwin Booth said it was absolutely without foundation, it will always be associated with that actor's name. As the story goes, Booth, when intoxicated one night, refused to end "Macbeth" by the book, and, becoming infuriated with the actor who was playing Macduff, chased him off the stage on to the street and through several thoroughfares. Usually this was supposed to have happened at the old Bowery Theatre, New York. As a matter of fact, the actor never did anything of the kind, for when he drank too much he became, as some men do when under the influence of liquor, very mild, very gentle, and easy to deal with. To further show how false the story is, Edwin Booth told me that not once, but a dozen times did he meet old men who would say, on being introduced, "Mr. Booth, I saw your father on that celebrated night," etc., and then they would go on to tell the story, and in each instance a different theatre would be named.

"SPEAKING FOR MY BENEFIT, BUT PRETENDING NOT TO SEE ME."

As a boy, John Wilkes Booth showed a decided inclination for the stage, and I can remember a number of our joint efforts at producing plays. He had also a mania for killing cats, and went about it with enthusiasm that was quite remarkable. One morning when I was at breakfast in my mother's kitchen, I heard a tap on the window, and, looking out, saw John, his nose flattened against the pane, motioning vehemently for me to come out. When I did so, he said that he had some cats that he wanted me to see. We went over to a wheelwright's lot, and he showed me two cats that he had tied up in such a way that a movement of the one would produce pain to the other. He seemed to thoroughly enjoy their discomfiture. Another time I saw him chase a cat up through an attic and on to a roof that was remarkably steep; if he had made the least slip he would have fallen and probably killed himself. But he never stopped till he got the cat.

In some ways John Wilkes Booth was a very remarkable actor. His education had not been very complete, and he had a peculiar way of pronouncing certain words —the only blemish in his performance.

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But his voice was so beautiful, and his intensity so great, that when he became aroused these mispronunciations were not noticed. His "Richard III." was the most melodramatic piece of acting I ever saw, and he would arouse the audience to a pitch of enthusiasm that, so far as my recollection goes, has never been equalled.

About four months before the assassination of Lincoln I was playing in St. Louis. John Booth came there to play an engagement. The night of his arrival in town he came to my dressing-room, and we agreed to meet at a restaurant after the performance. As I entered the place of meeting, I met a Lieutenant Martin, a fine old soldier of the United States regular army, whom I knew and liked very well. Martin and I walked in together talking, and when Booth came up I said:

"Lieutenant Martin, my friend, Mr. Booth—Mr. Booth, Mr. Martin."

Martin held out his hand, but Booth struck it with terrific force and said:

"I shall never take the hand of a damned Yankee," and then walked out of the place.

I was amazed and dumfounded, and so was Martin. The lieutenant was no coward, but he said nothing, out of consideration, I think, for me. I apologized the best I could and rushed after Booth, who was waiting for me on the street.

"What, in Heaven's name," I said, "do you mean by acting in that way?"

"You should know better," he replied, "than to introduce me to one of those —— —— Yankees." We had some words, and I left him.

To show how much of a gentleman Martin was, he never mentioned the incident to any one, for if he had, I am quite sure Booth would have been torn to pieces before he could get out of St. Louis.

Two weeks before the assassination of President Lincoln, I was walking along Market Street, Philadelphia. My companion said:

"There is John Booth on the other side of the street."

"I don't want to see him," I said, and we walked on, but as I looked at the man I could not help but admire his fine carriage and beautiful face. He was positively the handsomest man I ever saw.

To go back. Family difficulties made it necessary for me to do something to contribute toward my own living at a very early age. My mother thought of a dozen or more things I might try, but we both finally agreed that if I could become a page in Congress the cutting short of my education would not be a matter of so much regret. Reverdy Johnson, who was a distant relative of ours, gave me a letter to some friends in Washington. When I got there I found that I was one of a hundred boys who were after not more than a half-dozen places. I kept calling on the people to whom I had letters, and eventually secured Jefferson Davis as a sponsor. His letter to the doorkeeper of the House was very formal, but still it was a great kindness to a boy who had no influence either politically or socially. I spent day and night in the Capitol following about the man who had the appointing power; and he must have been a very patient man, I imagine, or I would never have escaped alive. Finally he promised me that if one of the boys should fall sick I should go on as a substitute. After that I waited patiently to hear of a sickness among the pages, but a healthier lot of boys, it seemed to me, never lived. They would not get sick at any price.

One morning I heard, with unlimited joy, that one of the boys had met with an accident, and I rushed to the House, found the doorkeeper, and reminded him of his promise. I had scarcely spoken, and been told that he would send me on the floor in place of the absent boy, when a dozen other aspirants came rushing in, he having made the same promise to them. It appeared to me that I must have been all eyes that day, for no member called a page from any part of the House that I did not see and immediately make a break for him. I was anxious to do all the work, and the rest of the boys were quite willing to let me do as much of it as I could. The speaker of the House at that time

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WALLACK'S THEATRE, BROADWAY, AT BROOME STREET.

was Howell Cobb, and Robert Toombs and Alexander Stephens of Georgia were members. Mr. Toombs had signed my application. Quite naturally I kept my eye on him that fateful day, and lost sight of no opportunity to jump to his desk at the least provocation. Late in the afternoon, he and Mr. Stephens were at their desks, and talking to them was a very large gentleman with the biggest feet I ever saw on a man. Of course, like most boys, such a thing as that didn't escape the close observation of myself and the rest of the pages. Suddenly a member sitting directly behind Mr. Toombs clapped for a page. I immediately made for him, and in passing this ponderous man with the big feet I stumbled over him. I must have connected with his bunions with great force, for he gave me a nudge in the ribs with his elbow, which nearly floored me, and said:

"You careless little rascal, can't you see where you are going?"

Mr. Toombs laughed heartily, but I was in anything but good humor over the incident. Having completed my errand for the member who had called, I took my seat below the speaker's desk. The man with the big feet who, as I afterward learned, was Gen. Winfield Scott, left the House a few minutes later, and Mr. Toombs called me. He was in excellent humor and said:

"Son, there's another man over there with big feet, and if you will go and fall over them I will give you half a dollar."

Thinking he was having fun with me, I turned to leave for my post, when he said:

"You are a new boy here, aren't you?"

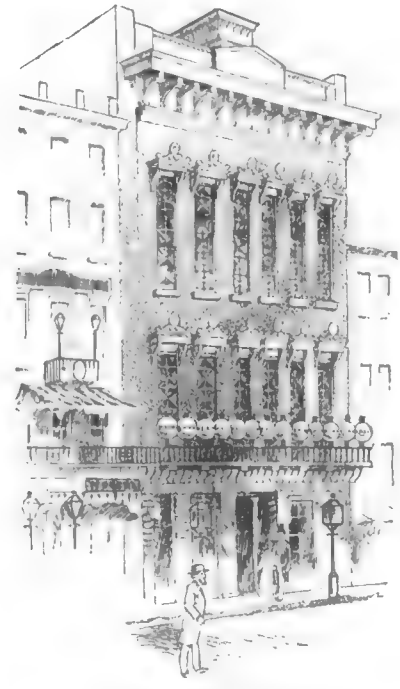
I explained to him that I was acting as substitute for that day only, and reminded him that he was on my petition for a regular place.

"Is that so?" said he. "Well, I will go right to the doorkeeper with you now and have it fixed." We both went direct to Mr. Horner, and Toombs said bluffly to him:

"Why don't you give this boy a place? Didn't I recommend him?"

The doorkeeper stated that he was crowded with applications; that there was no vacancy, but that when one would occur I should get it.

One morning, it seems, the parents of one of the boys took him away, and upon learning of it I immediately pounced upon



BROADWAY THEATRE, 1859.

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Mr. Horner to keep his promise, but again he had the same excuse to offer—"that he was crowded with other applications," and could not take care of me. Back I went to Mr. Toombs and related what had taken place.

"The devil you say," said the statesman from Georgia. "I'll see whether he puts you on or not."

Taking me by the hand, he walked directly over to where the doorkeeper was sitting and said:

"Why don't you put this boy on, as you agreed to?"

"My dear Mr. Toombs, I cannot do it. I have made some other promises that I must first fulfil."

"The thunder you must!" said Mr. Toombs very emphatically. "You'll either put this boy on, or I'll put you out."

From that day I was a page in the Capitol. But I got so big that I really had no excuse to continue the role of "boy," yet I kept the short jacket buttoned to the trousers until I was a sight. Mr. Toombs was then a great power in Washington, and his manner was so emphatic that he always got everything he wanted. In fact, the South, so far as patronage and politics were concerned, was a ruling factor.

Naturally, while my indebtedness to Mr. Toombs was great, I felt called upon to send a letter of thanks to all who had signed my petition, and of the many replies received was one (the pleasantest of all) from Jefferson Davis. He wrote a delightful letter, and closed with the following sentence: "It is likely that my influence availed you but little in securing the position, but I am glad you thank me, even for a fancied favor—ingratitude is a vice which the vilest is incapable of attributing to himself."

It did not take me long to become familiar with the duties of a page, nor did I lose any time in becoming acquainted with the different members. I had a gala time while there; it was a royal life for lads such as we were, but it had its bad effects. While we received but two dollars a day salary, yet we were constantly getting money from the members—and to go on a message for any member from the South always meant a gold piece.

I can easily bring to mind the fate of nearly all my associates of those days, as most of them turned out badly. Not many of them kept on the straight path. Perhaps it was not the plentifulness of money that caused it, but be that as it may, we generally had enough of the "root," so that we could send all of our salary home and still have more to spend than we earned legitimately.

Another source of income was getting the autographs of members. But this money was not by any means easy to earn. While some were willing enough to write their names, it was a difficult task to get others to sign; even those who had most trouble in writing seemed to be more possessed of the inclination to sign than others who prided themselves on their ability to write a legible hand; and of this class Andrew Johnson was the premier. He would never hesitate to write his autograph, although he had great difficulty in doing so. His style of writing was peculiar, for one must remember that his education had not been gleaned in a schoolhouse. In signing his name, he would put his tongue to one side of his mouth and sway his body with every movement of his pen, like an Irishman who is a little in doubt about his ability even to make his mark. When Johnson would sign his name, it would always be great fun for the boys, and they constantly played pranks on him. The members were equally as bad as the boys, and would often prompt them to go to him for his signature, for the purpose of watching him write it.

My career as a page for about two years or more brought me into contact with many of the senators as well as members, as we were constantly running over with messages, and I soon became acquainted with some of them. Some were gruff, others pleasant. I remember that Mr. Douglas was exceedingly popular, and on this account we always ran a race to see who would go to him with a message or on an errand for him. He would often come

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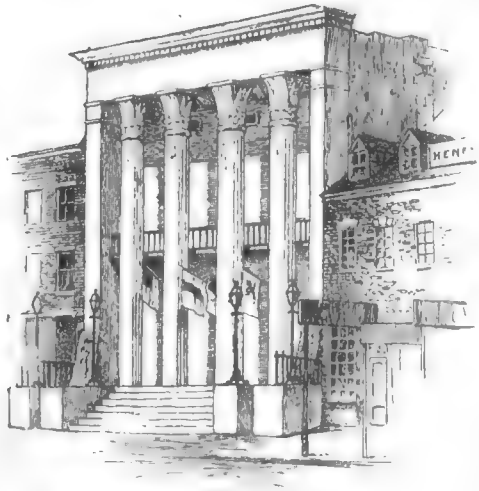
and talk with us, say pleasant things, and give us good advice. Mr. Clay and Mr. Calhoun were also men whom we liked a great deal; but we all fought shy of Mr. Webster. He had very little to say to us, and toward the end of the first session of the Thirtieth Congress made an attack on the boys.

HOME OF JOHN WILKES BOOTH, AT BALTIMORE.

It had been the habit in those days, at the end of the session, to vote each of the pages $200 additional compensation. It was usually tacked on to some appropriation bill that was rushed through during the last hours of the session, otherwise it would never have passed, as there was really no excuse for it. The first time I was interested in this bill a strong opposition had sprung up against it, and this served to bring to my mind the influence that children can exert over grown persons; never did I see such an evidence of it as in the passage of that appropriation. Each page resolved himself into a lobbyist, and for days before the bill came up we pestered the members with requests to vote for it. Some of them said "yes," others that they couldn't conscientiously vote for it, but that they would manage to absent themselves when the bill came up. Very few said "no." Andrew Johnson was bitterly opposed to it, and none of the boys had influence enough with him to even get him to agree to absent himself. Although there were other objectors, we finally hit upon a scheme whereby we could get all the obnoxious members out of the House when the question came up, except Mr. Johnson. Even Mr. Cobb, the speaker, agreed to vacate the chair before the item was considered, although he was opposed to the bill, but the pressure brought to bear on him was too strong, and he yielded. He promised to call Mr. Bissell, of Illinois, who was in favor of the appropriation. The speaker's page was in with us, of course, and was watching the bill, section by section, with eager eyes. As this item was approached, a boy was sent to Mr. Bissell's elbow, that he might not forget the vital moment. When the time came Mr. Bissell was nudged, and the speaker's page called Mr. Cobb's attention to the fact that the moment had arrived when Mr. Bissell was to take the chair. Each boy nailed his objector and got him out of the House by some hook or crook. To me, at the last moment, was assigned the task of getting rid of Mr. Johnson, but I was at a loss to know how to manage him. I hit upon a bold scheme, however, and, running around to his seat, said:



THE OLD BOWERY THEATRE, 1860.

"Mr. Johnson, there's a lady outside dressed in very deep black who brings some sad news from your family, evidently, as she is crying."

He got up immediately and followed me out into the rotunda, for, by a strange coincidence, he had some one at

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home very sick at that time. The new halls of Congress had not yet been built. As luck would have it, there was one lady there. Pointing her out to Mr. Johnson, who started in that direction, I rushed back into the hall just as the bill was being passed. Mr. Johnson returned in a few minutes and began making inquiry as to who that little rascal was who brought him that last message.

The House breathed easier after the bill passed, but we were quite uncertain as to its fate in the Senate. The boys over there were equally interested with us, and they went to work on their side. They got all the help possible from us whenever opportunity offered, but the bill would never have passed had it not been for Mr. Webster. He was opposed to the appropriation, claiming that it was wrong both in principle and effect, and he could not vote for it. When this section came up he arose and declared his opposition and the grounds thereof. Had he stopped there we would never have won the fight, but some of the pages whose duty it was to clean the desks had lost some of his papers, and he was mad. Then he made a remark that defeated his object. He alleged that the boys were dishonest; that they were not entitled to any appropriation, even if it was right; that they were not worthy. Mr. Clay immediately arose, and in a speech that sparkled with passion espoused the cause of the pages, and administered a severe rebuke to Mr. Webster for descending from his high position as a statesman to attack the integrity of the children. That was enough. The incident passed the bill, and the boys were fast friends of Mr. Clay.

BURTON'S THEATRE, CHAMBERS STREET.

Mr. Clay further endeared himself to me shortly after that by giving me opportunity to earn $25. His compromise bill was then pending in the Senate, and it was taken up unexpectedly, when many of those opposed to it were absent, among them Mr. Douglas. There was great excitement among the opponents of the bill. Mr. Douglas was much sought after, and pages were running everywhere in an effort to locate him, while some senator was put up to talk against time. Douglas, though, was nowhere to be found. Seeing all the commotion, as I returned from an errand, I inquired what it was all about, and all replied in unison, "We want to find Mr. Douglas."

Just then Mr. Jeremiah Clemens, of Alabama, came up and said: "I'll give $25 to any one who will find Mr. Douglas."

I at once inquired of the boys where they had been, and suggested half a dozen places where he might be found, for the pages know very well the haunts of the congressmen. "We have been to all of them," said the boys in concert. I hit upon a place, after a moment's study, where I thought he might be. The boys seemed to have covered all the other territory. I rushed out of the door, grabbed my hat and started for the House. The pages in those days had horses to ride in going on errands. They were rather queer horses, but, nevertheless, they were better than none. Mr. Horner, the doorkeeper, had to give us an order for one. He kept them ready written, and they read, no matter what the boy's name, "Give Jake a horse." I got one, quickly ran and mounted one of the nags, and at the top of his speed dashed up the avenue. I drew up to the place about half a mile distant, dismounted, rang the bell, and asked

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if Mr. Douglas was in. "He is," said the servant. "Tell him Mr. Clay's compromise bill is about to pass, and he is wanted immediately." In a minute I heard Mr. Douglas's voice saying: "Great Heavens, is that so?"

The servant came back and told me to leave the horse at the door, and I started back toward the Capitol. Before I had gone a great distance I was passed by Mr. Douglas on the horse, making for the Capitol as fast as the animal could go. I thought then, and I think now, that it was one of the funniest sights I ever saw —this large man, with an immense body and little, short legs, riding down the avenue astride the horse; and the awkwardness with which he sat his mount did not improve his appearance. I got the $25, however, for my part in bringing Mr. Douglas to the great debate on the compromise bill.

As I look back to those times, now forty years behind me, it seems as though everything was then conducted with great laxity. The sergeant-at-arms used to pay the members in gold, and the congressmen would send the boys after it with the greatest freedom. Sometimes the amount would be small, and sometimes far larger than should have ever been trusted to such young hands. One day I was sent to Riggs's bank, where the deposits were kept, with an order for $2,000. It was handed to me in two cotton bags, very loosely tied at the ends. After I mounted my horse, I found it difficult to carry. So, at the first cigar shop I came to I stopped, dismounted, went in, and got a piece of twine and tied the two bags together. I then mounted and went galloping down the avenue. Just as I reached the corner by the old National Hotel the horse shied suddenly, and threw me off. The same movement broke the string holding the bags of gold. As they struck the ground one burst, and the gold pieces went flying in every direction. The lounging negroes about the place came out and helped me pick them up. I was nearly scared to death, but never lost a gold piece. I breathed much easier when I landed my treasure at the Capitol, and never again went after a large sum of money if I could possibly get out of it.

These recollections of the caprices and events of those days are only in the nature of glimpses at the real facts, but they interest me as I contrast them with the mighty strides this country has made since those days, and the wonderful history it has written since the hour when the fagots of war were but just being put in place.

[*Continued in August.*]

[In the next instalment Mr. Robson tells of his introduction to stage-life and his earliest experiences as an actor.]

A MOONLIGHT SERENADE.

THE clouds flit o'er the starlit sky,
O'er fields the shadows creeping,
As whisp'ring through the lanes they hie—
Beware! The moon is peeping.

She is so happy! He so gay!
With lovers' tales beguiling.
The hours so quickly pass away—
And see! the moon is smiling.

He, enraptured, dreams of bliss—
Coyly she is chiding—
Stays her speech with lover's kiss—
The moon its face is hiding.

Oh! tell no tales, fair lady moon,
Their inmost thoughts divining,
Or much I fear when next they walk
The moon must *not* be shining.

H. J. NICHOLLS.

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A SNAP SHOT FROM THE TOP OF A MODERN "SKY-SCRAPER."

PICTURE PARAGRAPHS.

[*We shall be glad to consider photographs of all kinds suitable for this section of the magazine, and to pay for such as are accepted.*—ED.]

A NEW METHOD OF COALING SHIPS.

For several years the Navy Department has been giving careful consideration to the establishment of permanent coaling stations at the most important strategic points, appreciating the necessity of having an accumulation of coal on hand for emergency; of protecting the fuel from deterioration resulting from exposure to weather, and constructing mechanical devices to handle coal from store to vessel with the greatest rapidity.

The photograph below represents the

Photo by F. S. Livingstone.

A NEW METHOD OF COALING SHIPS

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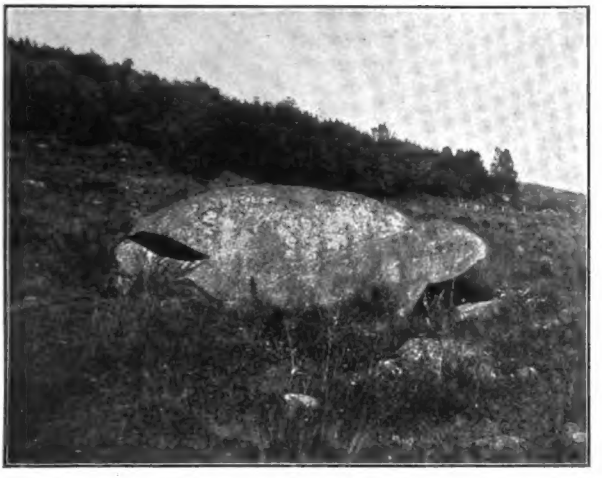
first completed plant of this kind, just finished at the Naval Station, New London, Conn. The great travelling bridges shown in the photograph run on two parallel sets of railroad lines, one extending along a pier and the other along the shore. There are fourteen hatches on each side of the



THE TURTLE ROCK.

building, so that it is always possible to establish a direct line of communication between one of these and the hatches on board the vessel that is coaling. The fuel is carried in bags that are drawn along by means of an endless rope.

REMARKABLE ROCKS.

We reproduce on this page photographs of two remarkable rock formations. The Turtle rock, which may be seen in the White Mountains of New Hampshire, is doubly curious, since, while resembling a turtle when looked at from one aspect, it has the appearance of a fish from another point of view. The Dog rock may be seen at Sugar Hill, also in the White Mountains.

A LIFE-SAVING COLLAR.

This new form of life-saver is the invention of M. Hubert de Wilde, of Ghent, Belgium. It is a collar made up of a number of cork sections with a spring hinge at one side and an opening on the other by means of which it can be passed round the neck. It is therefore extremely simple to put on, whereas the ordinary life-saving belt when the moment of emergency arrives puzzles the majority of people who endeavor to make use of it. Only the head is kept above the water, and this is a further point in favor of the invention, since the wearer is less likely to take cold when no part of his body wrapped in wet clothes is exposed to the air. Mr. Richena Le Bent, the United States Consul at Ghent, recently sent to the State Department a complete description of the new collar, which he commended in the warmest terms.

A MOUNTAIN OF IRON.

A mountain of iron, if located

Photo by C. H. Blake, Jr.

THE DOG ROCK.

in Pennsylvania, would have been bored through and through, and become a beehive of industry. Wyoming's mountain of iron lies silent in the wilderness. Without transportation facilities this mass has merely potential value. It has been a landmark for years on the Western stretches and its symmetry has not yet been marred by a single tunnel. Wyoming sent an

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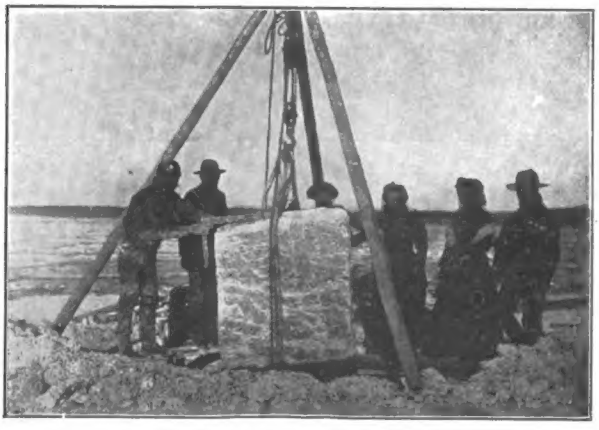
A LIFE-SAVING COLLAR.

exhibit of iron to the World's Fair and numbers the metal among her unworked resources. Iron Mountain has not its equal in any other State of the Union. It is stupendous in girth, and depressing in the deadness of its tints and the total absence of vegetation from its gaunt sides.

THE LARGEST BLOCK OF SODA EVER MINED.

So far as known, the largest block of soda ever mined in this country was a cube of eight feet in each direction. Another cube of respectable dimensions was recently taken from the same soda lake near Laramie, Wyoming.



THE BIGGEST BLOCK OF SODA EVER MINED.

The State geologist was asked to account for these extraordinary deposits. "These soda lakes occur in depressions in mesozoic rocks which have an inlet but no outlet. The chemical composition of the sodium sulphate taken from them is practically the same. There has been much speculation as to the source of this soda compound, but no definite explanation can be offered. It is believed by some that the soda is brought in by the water from the country draining into the lake; by others that it is brought from other sources by the aid of springs. Both of these propositions are tenable, and I am inclined to think that both are right.

A MOUNTAIN OF IRON.

"The supply of sodium sulphate in these lakes is practically inexhaustible, for the deposits are continually accumulating more soda. There has been taken already from the Union Pacific lakes 10,000 tons of the salt."

The lakes cover an area of sixty acres, and the deposit is claimed to be over twelve feet in thickness. The soda is hauled from the lakes to the chemical works at Laramie, where it is calcined and shipped East for glass-making.

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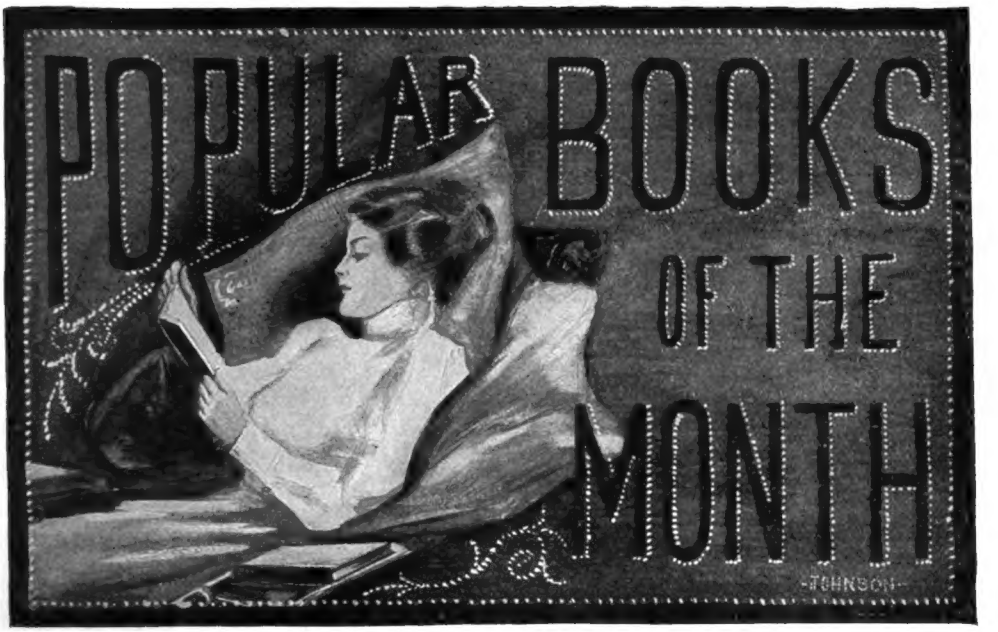

A CAREFUL canvass of the leading booksellers results in the compilation of the following list of books that have proved themselves most popular during the past month, as judged by the number of copies sold:

TITLE	AUTHOR	PUBLISHER AND PUBLISHER'S PRICE
To Have and to Hold,	Mary Johnston	(Houghton, Mifflin & Co., $1.50).
Red Pottage,	Mary Cholmondeley	(Harper & Bros., $1.50).
The Light of Scarthey,	Egerton Castle	(The Macmillan Co., $1.50).
A Gentleman from Indiana,	Booth Tarkington	(Doubleday & McClure Co., $1.50).
Sophia,	Stanley J. Weyman	(Longmans, Green, & Co., $1.50).
Three Men on Wheels,	Jerome K. Jerome	(Dodd, Mead & Co., $1.50).
Unleavened Bread,	Robert Grant	(Chas. Scribner's Sons, $1.50).
The Booming of Acre Hill,	John Kendrick Bangs	(Harper & Bros., $1.25).
Men With the Bark On,	Frederic Remington	(Harper & Bros., $1.25).
The Alabaster Box,	Walter Besant	(Dodd, Mead & Co., $1.50).
The Touchstone,	Edith Wharton	(Chas. Scribner's Sons, $1.25).
When Knighthood Was in Flower,	Edward Caskoden	(The Bowen-Merrill Co., $1.50).
The Trail of the Sand Hill Stag,	E. Seton-Thompson	(Chas. Scribner's Sons, $1.50).
The Biography of a Grizzly,	E. Seton-Thompson	(The Century Co., $1.50).
The Autobiography of a Quack,	S. Weir Mitchell	(The Century Co., $1.25).
Debts of Honor,	Maurus Jokai	(Doubleday & McClure Co., $1.25).
Resurrection,	Leo Tolstoy	(Dodd, Mead & Co., $1.50).
Lying Prophets,	Eden Phillpots	(Frederick A. Stokes Co., $1.50).
Captain Dieppe,	Anthony Hope	(Doubleday & McClure Co., 50 cts.).
The Rebel,	H. B. Marriott Watson	(Harper & Bros., $1.50).
Bob, Son of Battle,	Alfred Ollivant	(Doubleday & McClure Co., $1.25).
In Connection with the De Willoughby Claim,	Frances Hodgson Burnett	(Chas. Scribner's Sons, $1.50).

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TITLE	AUTHOR	PUBLISHER AND PUBLISHER'S PRICE
Prisoners of Hope,	Mary Johnston	(Houghton, Mifflin & Co., $1.50).
Via Crucis,	F. Marion Crawford	(The Macmillan Co., $1.50).
Joan of the Sword Hand,	S. R. Crockett	(Dodd, Mead & Co., $1.50).
The Grip of Honor,	Cyrus Townsend Brady	(Chas. Scribner's Sons, $1.50).
Robert Tournay,	William Sage	(Houghton, Mifflin & Co., $1.50).
The Love of Parson Lord,	Mary E. Wilkins	(Harper & Bros., $1.25).
The Strength of Gideon,	Paul Laurence Dunbar	(Dodd, Mead & Co., $1.25).
Sandburrs,	Alfred Henry Lewis	(Frederick A. Stokes Co., $1.50).
The Conspirators,	Robert W. Chambers	(Harper & Bros., $1.50).
A New Race Diplomatist,	Jennie Bullard Waterbury	(J. B. Lippincott Co., $1.50).
The Voice of the People,	Ellen Glasgow	(Doubleday, Page & Co., $1.50).
The Redemption of David Corson,	Charles Frederic Goss	(The Bowen-Merrill Co., $1.50).
The Bath Comedy,	Agnes and Egerton Castle	(Frederick A. Stokes Co., $1.50).
A Master of Craft,	W. W. Jacobs	(Frederick A. Stokes Co., $1.50).
Philip Winwood,	Robert Neilson Stephens	(L. C. Page & Co., $1.50).
Deacon Bradbury,	Edwin Asa Dix	(The Century Co., $1.50).
The Garden of Eden,	Blanche Willis Howard	(Chas. Scribner's Sons, $1.50).
His Lordship's Leopard,	D. D. Wells	(Henry Holt & Co., $1.50).
Life's Trivial Round,	Rose Nouchette Carey	(J. B. Lippincott Co., $1.25).
Fruitfulness,	Emile Zola (Translated by Ernest Alfred Vizetelly)	(Doubleday, Page & Co., $2.00).
The Ways of Men,	Eliot Gregory	(Chas. Scribner's Sons, $1.50).
Towards Pretoria,	Julian Ralph	(Frederick A. Stokes Co., $1.50).
Briton and Boer,	James Bryce	(Harper & Bros., $1.25).
The Transvaal from Within,	J. P. Fitzpatrick	(Frederick A. Stokes Co., $2.50).
Wild Animals I Have Known,	E. Seton-Thompson	(Chas. Scribner's Sons, $2.00).
John Ruskin,	M. H. Spielman	(J. B. Lippincott Co., $2.00).
Letters of Honoré de Balzac to Mme. Hanska,	Translated by Katherine Prescott Wormeley	(Hardy Pratt & Co., $1.50).
The Domestic Blunders of Women,	"A Mere Man"	(Funk & Wagnalls, $1.00).
Home and Garden,	Gertrude Jekyll	(Longmans, Green, & Co., $3.50).
From Capetown to Ladysmith	George W. Steevens	(Dodd, Mead & Co., $1.25).
Nature's Garden,	Neltje Blanchan	(Doubleday, Page & Co., $3.00).
A Guide to the Trees,	Alice Lounsberry	(Chas. Scribner's Sons, $3.00).
History of the People of the U. S., Vol. V.,	John Bach McMaster	(D. Appleton & Co., $2.50).
Paris As It Is,	Katherine De Forest	(Doubleday, Page & Co., ($1.25).
The Light of Day,	John Burroughs	(Houghton, Mifflin & Co., $1.25).
The Statesman's Year Book for 1900,	Edited by J. Scott Keltie	(The Macmillan Co., $3.00.)
Our Presidents and How We Make Them,	Col. A. K. McClure	(Harper & Bros., $2.00).

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